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DISEASES

OF

MODERN LIFE.

BY

BENJAMIN WARD RICHARDSON,

M. D., M. A., F. R. S., Fellow of the Royal College of Physicians; Honorary Physicia
to the Royal Literary Fund, and to the Newspaper Press Fund; Honorary
Member of the American Philosophical Society; Honorary
Member of the Imperial Leopold Carolina
Academy of the Natural Sciences.

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TO

WILLIAM FARR, M.D., D.C.L., F.R.S.

CORRESPONDING MEMBER OF THE INSTITUTE OF FRANCE.

My dear Farr,

I might most correctly dedicate a book to you, in simple remembrance of a friendship which, through the long spell of twenty-five years, has been an unbroken chain of pleasant memories.

But I add to this reason another.

In so far as an author can show admiration and respect by the act of a dedication, I would now show to you, with all my heart, how deeply I appreciate your scholarly learning; your marvellous industry; your pre-eminent services to your country and your age as a pioneer in constructing the science of vital statistics; and the incomparable aid you have rendered to all of us who have studied such subjects as are written in this volume.

Yours ever Faithfully,

BENJAMIN W. RICHARDSON.

PREFACE.

ELEVEN years ago I published a series of essays on diseases of overworked men, in order to direct attention to the physical injuries of the body that are induced by excessive mental work and worry, and by excessive physical exertion. These essays were followed by others on disease from some occupations, from indulgence in alcohol, and from the use of tobacco.

At the time they were written, and long afterwards, the essays excited much public interest, and at the instance of Mr. Macmillan I undertook to republish them in a collected form.

In the work of revision many other subjects occurred to me as of similar order and interest, and I have been led, consequently, while retaining that which I have already published, to construct the volume that is herewith presented.

The book, medical in all its aspects, is avowedly written for the study of the intelligent public as well as for medical men; but whoever opens it to find "domestic medicine," or revelations of the arcanum of medicine, will be deceived. I have written, feeling that the day of popular receipts has gone by, and that the arcanum is dissolved.

Avoiding every infringement on the art proper of curing disease, I have in these pages considered only the science of prevention, which many can understand, and which is a profitable science to all who condescend to learn it.

12, HINDE STREET, MANCHESTER SQUARE, W.
Christmas Day, 1875.

CONTENTS.

PART THE FIRST.

PHENOMENA OF DISEASE, INCIDENTAL AND GENERAL.

CHAPTER I.

PAGE
NATURAL LIFE TO NATURAL DEATH—EUTHANASIA . . . 3

CHAPTER II.

THE PHENOMENA OF DISEASE—CLASSIFICATION AND DISTRIBUTION 11

CHAPTER III.

DISEASE ANTECEDENT TO BIRTH 26

CHAPTER IV.

EXTERNAL ORIGINS AND CAUSES OF DISEASE 43

CHAPTER V.

PHENOMENA OF DISEASE FROM CAUSES EXTERNAL AND UNCONTROLLABLE 53

CHAPTER VI.

PHENOMENA OF DISEASE FROM CAUSES EXTERNAL AND COMMUNICABLE 79

CHAPTER VII.

PHENOMENA OF DISEASE INCIDENTAL TO OLD AGE AND NATURAL DECAY 101

PART THE SECOND.

PHENOMENA OF DISEASE, INDUCED AND SPECIAL.

CHAPTER I.

DEFINITION AND CLASSIFICATION 119

CHAPTER II.

DISEASE FROM WORRY AND MENTAL STRAIN 123

CHAPTER III.

INDUCED DISEASE FROM PHYSICAL STRAIN 148

CHAPTER IV.

INDUCED DISEASE FROM PHYSICAL STRAIN—*continued* . . 164

CHAPTER V.

DISEASE FROM COMBINATION OF PHYSICAL WITH MENTAL STRAIN 184

CHAPTER VI.

ON DISEASE FROM THE INFLUENCE OF THE PASSIONS . . 193

CHAPTER VII.

ON DISEASE FROM ALCOHOL—PHYSIOLOGICAL PROEM . . 209

CHAPTER VIII.

PHENOMENA OF DISEASE FROM ALCOHOL — THE FUNCTIONAL TYPE 237

CHAPTER IX.

ORGANIC DISEASE FROM ALCOHOL 248

CHAPTER X.

ON DISEASE FROM TOBACCO—PHYSIOLOGICAL PHENOMENA 273

CHAPTER XI.

PHENOMENA OF DISEASE FROM TOBACCO 286

CHAPTER XII.

NERVOUS DISEASE FROM TOBACCO 310

CHAPTER XIII.

DISEASE FROM THE USE OF NARCOTICS 324

CHAPTER XIV.

DISEASE FROM FOODS 341

CHAPTER XV.

DISEASE FROM IMPURITY OF AIR 375

CHAPTER XVI.

DISEASE INCIDENT TO SOME OCCUPATIONS 397

CHAPTER XVII.

DISEASE FROM SLOTH AND IDLENESS 428

CHAPTER XVIII.

DISEASE FROM LATE HOURS AND BROKEN SLEEP. . . . 435

CHAPTER XIX.

DISEASE FROM ERRORS OF DRESS 446

CHAPTER XX.

DISEASE FROM IMITATION AND MORAL CONTAGION . . . 460

CHAPTER XXI.

AUTOMATIC DISEASE AND HYPOCHONDRIASIS 475

CHAPTER XXII.

INTERMARRIAGE OF DISEASE 484

PART THE THIRD.

SUMMARY OF PRACTICAL APPLICATIONS . . 489

PART THE FIRST.

PHENOMENA OF DISEASE, INCIDENTAL AND GENERAL.

DISEASES OF MODERN LIFE.

PART THE FIRST.

PHENOMENA OF DISEASE, INCIDENTAL AND GENERAL.

CHAPTER I.

NATURAL LIFE TO NATURAL DEATH—EUTHANASIA.

By the strict law of Nature a man should die as unconscious of his death as of his birth.

Subjected at birth to what would be, in the after conscious state, an ordeal to which the most cruel of deaths were not possibly more severe, he sleeps through the process, and only upon the subsequent awakening feels the impressions, painful or pleasant, of the world into which he is delivered. In this instance the perfect law is fulfilled, because the carrying of it out is retained by Nature herself: human free-will and the caprice that springs from it have no influence.

By the hand of Nature death were equally a painless portion. The cycle of life completed, the living being sleeps into death when Nature has her way.

This purely painless process, this descent by oblivious trance into oblivion, this natural physical death, is the true Euthanasia; and it is the duty of those we call physicians to secure for man such good health as shall bear him in activity and happiness onwards in his course to this goal. For Euthanasia, though it be open to everyone born of every race, is not to be had by any save through obedience to those laws which it is the mission of the physician to learn, to teach, and to enforce. Euthanasia is the sequel of health, the happy death engrafted on the perfect life.

When the physician has taught the world how this benign process of Nature may be secured, and the world has accepted the lesson, death itself will be practically banished; it will be divested equally of fear, of sorrow, of suffering. It will come as a sleep.

If you ask me what proof there is of the possibility of such a consummation, I point to our knowledge of the natural phenomena of one form of dissolution revealed to us even now in perfect, though exceptional, illustration. We have all seen Nature, in rare instances, vindicating herself despite the social opposition to her, and showing how tenderly, how soothingly, how like a mother with her foot on the cradle, she would, if she were permitted, rock us all gently out of the world. How, if the free-will with which she has armed us were brought into accord with her designs, she would give us the riches, the beauties, the wonders of the Universe for our portion so long as we could receive and enjoy them; and at last would gently withdraw us from them, sense by sense, with such imperception that the pain of the withdrawal would be unfelt and indeed unknown.

Ten times in my own observation I remember witnessing, with attentive mind, these phenomena of natural Euthanasia. Without pain, anger, or sorrow, the intellectual faculties of the fated man lose their brightness. Ambition ceases, or sinks into desire for repose. Ideas of time, of space, of duty, lingeringly pass away. To sleep and not to dream is the pressing and, step by step, still pressing need; until at length it whiles away nearly all the hours. The awakenings are short and shorter; painless, careless, happy awakenings to the hum of a busy world, to the merry sounds of children at play, to the sounds of voices offering aid; to the effort of talking on simple topics and recalling events that have dwelt longest on the memory; and then again the overpowering sleep.

Thus on and on, until at length, the intellectual nature lost, the instinctive and merely animal functions, now no longer required to sustain the higher faculties, in their turn succumb and fall into the inertia.

This is death by Nature, and when mankind has learned the truth, when the time shall come —as come it will—that "there shall be no more an infant of days, nor an old man who hath not filled his days," this act of death, now, as a rule, so dreaded because so premature, shall, arriving only at its appointed hour, suggest no terror, inflict no agony.

The sharpness of death removed from those who die, the poignancy of grief would be almost equally removed from those who survive, were natural Euthanasia the prevailing fact. Our sensibilities are governed by the observance of natural law and the breach of it. It is only when nature is vehemently interrupted that we either wonder or weep. Thus the old Greeks, fathers of true mirth, who looked on prolonged grief as an offence, and attached the word madness to melancholy,— even they were so far imbued with sorrow when the child or the youth died, that they bore the lifeless body to the pyre in the break of the morning, lest the sun should behold so sad a sight as the young dead; while we, who court rather than seek to dismiss melancholy, who find poetry and piety in melancholic reverie, and who indulge too often in what, after a time, becomes the luxury of woe, experience a gradation of suffering as we witness the work of death. For the loss of the child and the youth we mourn in the perfect purity of sorrow; for the loss of the man in his activity we feel grief mingled with selfish regret that so much that was useful has ceased to be. In the loss of the aged, in their days of second childishness and mere oblivion, we sympathize for something that has passed away, and for a moment recall events saddening to the memory; but how soon this consoling thought succeeds and conquers—that the race of the life that has gone was run, and that for its own sake the dispensation of its removal was most merciful and most wise.

To the rule of natural death there are a few exceptions. Unswerving in her great purposes for the universal good, Nature has imposed on the world of life her storms, earthquakes, lightnings, and all those sublime manifestations of her supreme power which, in the infant days of the universe, cowed the boldest and implanted in the human heart fears and superstitions which in hereditary progression have passed down even to the present generations. Thus she has exposed us all to accidents of premature death, but, with infinite wisdom, and as if to tell us that her design is to provide for these inevitable calamities, she has given a preponderance of number at birth to those of her children who by reason of masculine strength and courage shall have most frequently to face her elements of destruction. Further, she has provided that death by her, by accidental collision with herself, shall, from its very velocity, be freed of pain. For pain is a product of time. To experience pain the impression producing it must be transmitted from the injured part of the living body to the conscious centre, must be received at the conscious centre, and must be recognized by the mind as a reception; the last act being in truth the conscious act. In the great majority of deaths from natural accidents there is not sufficient time for the accomplishment of these progressive steps by which the consciousness is reached. The unconsciousness of existence is the first and last fact inflicted upon the stricken organism: the destruction is so mighty, that the sense of it is not revealed.

The duration of time intended by Nature to extend between the birth of the individual and his natural Euthanasia is undetermined, except in an approximative degree. From the first, the steady, stealthy attraction of the earth is eve
telling upon the living body. Some force liberat
from the body during life enables it, by self-c
trolled resistance, to overcome its own wei

For a given part of its cycle the force produced is so efficient, that the body grows as well as moves by its agency against weight; but this special stage is limited to an extreme say of thirty years. There is then another period, limited probably also to thirty years, during which the living structure in its full development maintains its resistance to its weight. Finally, there comes a time when this resistance begins to fail, so that the earth, which never for a moment loses her grasp, commences and continues to prevail, and after a struggle, extended from twenty to thirty years, conquers, bringing the exhausted organism which has daily approached nearer and nearer to her dead self, into her dead bosom.

Why the excess of power developed during growth or ascent of life should be limited as to time; why the power that maintains the developed body on the level plain should be limited as to time; why the power should decline so that the earth should be allowed to prevail and bring descent of life, are problems as yet unsolved. We call the force that resists the earth, Vital. We say it resists death, we speak of it as stronger in the young than in the old; but we know nothing more of it really, from a physical point of view, than that while it exists it opposes terrestrial weight sufficiently to enable the body to move with freedom on the surface of the earth.

These facts we accept as ultimate facts. To say that the animal is at birth endowed with some reserved force, something over and above what it obtains from food and air, would seem a reasonable conclusion; but we have no proofs that it is true, save that the young resist better than the old. We must therefore rest content with our knowledge in its simple form, gathering from it the lesson that death, a part of the scheme of life, is ordained upon a natural term of life, is beneficently planned, "is rounded with a sleep."

CHAPTER II.

THE PHENOMENA OF DISEASE—CLASSIFICATION AND DISTRIBUTION.

To that condition of man which leads to death before the completion of the natural cycle of life and the natural Euthanasia, we apply the term Disease. But, as disease appears under various forms, each represented by phenomena so grouped together and so steadily reappearing in the same order as to be distinctive in character, a particular name has been applied to the several forms, which thus specified, have themselves been called diseases.

The Names of Disease.

The naming of these groups of phenomena has been unsystematic and fanciful. The movements of an animal, the dancing of fanatics at the shrine of a saint, the sensation of strangling or suffocation, the flowing of a stream or current, the burning of a fire, the effect of being stricken or knocked down, words or terms signifying these meanings, such as cancer, St. Vitus' dance, angina, catarrh, inflammation, apoplexy, and others equally fantastic, yet often forcible, have made up from the earliest times the nomenclature of disease—a nomenclature imperfect even for technical purposes of language, and inapplicable altogether for the higher developments of medical scientific research and practice.

In the course of time the whole subject of the naming of the phenomena of disease will have to be recast. The term disease will come to signify unity—a departure from an approximative standard of health, manifested by a series of definable phenomena, each traceable to some modification of a natural or physiological animal process. Then, to each series of defined phenomena a simple name will be given, indicating either the physiological disturbance upon which the unnatural symptoms that are presented depend, or upon the cause of the disturbance. Seventeen years ago I wrote the same suggestion, hoping that the old and crude method of naming the special phenomena of disease, as if each group were an entity, would die out. Unfortunately such hope was too earnestly precipitate. In the last few years the ancient error has been greatly exaggerated; the figures of the old gods remain on their altars, and new ones have been added as infinitely grotesque as any that have preceded.

For the present I fear we must rest content with the names we possess of the varied classes of phenomena which make up the unity of disease, however foolish those names may be. It is probable that disease, as a whole, is not as yet understood with sufficient comprehensiveness to allow of a revised and simplified nomenclature. I shall nevertheless show, as I proceed, that the bases really exist on which to found a simple classification of diseases according to the causes by which they are induced.

Disease in relation to Historic Time.

The so-called diseases, or specific phenomena of disease, which we in this day recognize as in active operation, though with different values of intensity, are fully two hundred and fifty in number. About one hundred of these help to make out the current and regular mortalities of civilized communities in our modern times.

In looking back at the history of disease in so far as it is written in parallel page with the history of man, we find how distinct the groupings of the phenomena have continued in relation to time and how remarkably fixed. From age to age and from one civilization to another they have retained their integrity of type, few becoming actually lost, and few springing forth as absolutely new. It is true that certain maladies to which definite characteristics and names have been assigned are of rarer occurrence in some periods than in others. Still, the maladies remain, and when they appear, even in the most isolated form, they are as they were when they were originally described. The malady known as ague was once so common in London that the metropolitan physician looked upon it as one of the most ordinary disorders he was called upon to treat; now it is so rare that a practitioner may live for years and never see an example of it; but when it is met with it is found to be made up of the same symptoms as when Sydenham so graphically depicted it. The sweating sickness which invaded England with the Earl of Richmond, and which, when he became the triumphant Henry the Seventh, obtained the second name of "the king of England's sickness," has not appeared in the epidemic form since 1551. Yet in our own time a typical, though, happily, isolated, example of it has been witnessed. The black death is still represented in malignant typhus. The great plague of Athens was neither more nor less than a terrible visitation of what we now call malignant scarlet fever. Small-pox has shown no abatement of its fury, when it has had the opportunity of becoming fully developed, from that which it showed when Rhazes of the ninth century, following Aaron of the sixth, committed to parchment the description of its phenomena.

Carcinoma—cancer—is the same intractable, painful, fatal malady to us as it was to Hippocrates, Galen, and Paulus Ægineta. Gout, as we see it here, in this century, is the same as it was to Alexander of Tralles. Modern phthisis pulmonalis is identical with the description so faithfully rendered of it by Cælius Aurelianus. Inflammation is practically known to us by no better signs than the four distinguishing ones left us by Celsus—"redness, swelling, heat, and pain;" while in these days, as in his, the contest commenced by Erasistratus continues, as to whether there can be fever without inflammation; that is to say, whether, whenever there is general fever, there is not of necessity a local inflammation in some organ or structure of the affected body, or whether a general fever may exist independently of any such local disturbance.

In brief, the more deeply we study the past history of medicine the surer is the conviction that, throughout the whole of the known period of human existence on the earth, not one new disease has been added, not one withdrawn. This is so true, that phenomena of disease which have been described by the ancients and have been ignored by subsequent writers, have reappeared to attest as truth what has passed for fable. The phenomenon called, in early times, "bloody sweat," has been disputed. But in our days this phenomenon has been seen. I have seen it myself, and although we now recognize, in observing it, that blood does not veritably exude from the skin when the red-coloured perspiration breaks forth, as was originally supposed, we admit that the exuded fluid is nevertheless a product of the blood, and that the primitive definition is therefore substantially correct.

In like manner, the great plague which visited Constantinople in 543, and which Procopius and Euagrius described, the plague of hallucination, drowsiness, slumbering, distraction, and ardent fever, with eruption on the skin of black pimples the size of a lentil; this plague—which usually killed in five days; and left many who recovered with withered limbs, wasted tongues, stammering speech, or such utterance of sound that their words could not be distinguished; this plague, which had passed into mythical learning under the name of "cerebro-spinal meningitis," has also in our time reappeared.

Disease in relation to Terrestrial Space.

The phenomena of disease, unlimited by time and almost unchecked by science, are nevertheless, to a certain extent, bounded by space. They are, I mean, confined by certain influences belonging to certain parts of the surface of the planet. The rules on this head are simple. Some phenomena of disease are developed in all parts of the earth. Some phenomena which could probably be developed in all parts, are actually developed only in certain parts. Some phenomena are capable of development in certain regions and in none other.

The phenomena of disease included under the first of these classes, and which may be called the universal, are many. Diseases of nervous origin, such as epilepsy, paralysis, apoplexy, are of this kind: certain plagues, as small-pox and cholera, which spread wherever they are carried, are of this kind: those maladies which spring from the habits or social conditions of a community, whether they be acquired by imitation or by invention,—habits, for example, of uncleanliness, the use of intoxicating fluids, or the mechanical restraints imposed upon the body—are also of this kind.

The phenomena included under the second class are those special to localities, such as pellagra—Lombardo-Venetian leprosy—goître and crétinism. These, either from peculiarities of the locality or from the hereditary susceptibilities of its inhabitants, are as distinctive and local as the hills, rivers, woods, or monuments of the same locality.

The phenomena included under the third class are those which will not travel out of certain defined conditions that are obviously necessary for their existence. Of these the phenomena of disease known as yellow fever, which can only continue in parts of the earth where there is a mean temperature above 68° F., form a good illustration. The phenomena of the disease typhus fever, which flourish only in regions having a range of temperature lying between 40° and 62° F., form another illustration. The phenomena of the disease phthisis pulmonalis, which are so limited by a given degree of cold that they cannot exist in the Hebrides, the Faroe Islands, Iceland, and the Arctic regions; and the phenomena of catarrhs or colds, which are confined within a range of temperature extending from a mean of 41° F. to the extreme cold of the Arctic climate, are other and similar examples.

It would lead me too far away from my present object to use all the materials at my command in the detailed exposition of the facts I have thus cited in the history of disease. I have wished simply to indicate that the history of the phenomena of disease is coeval with the history of man; that some of these phenomena are universal as man himself; that others are limited by place and condition: but that all have old foundations, coexistent with man, so that man had only to be developed for them to be potential.

Disease in relation to Race.

It is a question of great moment whether disease is modified by qualities of race. Until quite recently we had no evidence bearing upon this question that could at all elucidate it, and even now the trustworthy knowledge we possess is exceedingly small. Through the valuable labours of M M. Legoyt, Hoffmann, Neufville and Mayer we have obtained, however, some curious facts relative to the most widely disseminated of all races on the earth, the Jewish. These facts show, that, from some cause or causes, this race presents an endurance against disease that does not belong to other portions of the civilized communities amongst which its members dwell. The distinctness of the Jews in the midst of other and mixed races singles them out specially for observation, and the history they present of vitality, or in other words, of the resistance to those influences which tend to shorten the natural cycle of life, is singularly instructive.

The resistance dates from the first to the last periods of life. Hoffmann finds that in Germany from 1823 to 1840 the number of still-born amongst the Jews was as 1 in 39, and of the other races 1 in 40. Mayer finds that in Furth, children from one to five years of age die in the proportion of 10 per cent. amongst the Jewish, and 14 per cent. amongst the Christian population; and M. Neufville, dealing with the same subject from the statistics of Frankfurt, gives even a more favourable proportion of vitality to the Jewish child population. Continuing his estimate from the age named into riper years, the value of life is still in favour of the Jews; the average duration of the life of the Jew being forty-eight years and nine months, and of the Christian thirty-six years and eleven months. In the total of all ages, half of the Jews born reach the age of fifty-three years and one month, whilst half the Christians born attain the age of thirty-six years only. A quarter of the Jewish population is found living beyond seventy-one years, but a quarter of the Christian population is found living beyond fifty-nine years and ten months only. The Civil State extracts of Prussia give to the Jews a mortality of 1·61 per cent.; to the whole kingdom 2·62 per cent. To the Jews they give an annual increase of 1·73 per cent.; to the Christians, 1·36 per cent. The effectives of the Jews require a period of forty-one years and a half to double themselves; those of the other races fifty-one years. In 1849 Prussia returned one death for every forty of the Jews, and one for every thirty-two of the remaining population.

The Jews escape the great epidemics more readily than the other races with whom they live. Thus the mortality from cholera amongst them is so small that the very fact of its occurrence has been disputed.

Lastly, that element of mortality, suicide, which we may look upon philosophically as a phenomenon of disease, is computed by Glatter from a proportion of one million of inhabitants of Prussia, Bavaria, Würtemburg, Austria, Hungary, and Transylvania, to have been committed by rather less than one of the Jewish race to four of the members of the mixed races of the Christian populations.

Different causes have been assigned for this higher vitality of the Jewish race, and it were indeed wise to seek for the causes, since that race which presents the strongest vitality, the greatest increase of life, and the longest resistance to death, must, in course of time, become, under the influences of civilization, dominant. We see this truth indeed actually exemplified in the Jews; for no other known race has ever endured so much or resisted so much. Persecuted, oppressed by every imaginable form of tyranny, they have held together and lived, carrying on intact their customs, their beliefs, their faith for centuries, until, set free at last, they flourish as if endowed with new force. They rule more potently than ever, far more potently than when Solomon in all his glory reigned in Jerusalem. They rule, and neither fight nor waste.

Happily we have not far to go to find many causes for the high vitality of a race which, by comparison with the Saxon and the Celtic, is physically feeble. The causes are simply summed up in the term "soberness of life." The Jew drinks less than his "even Christian;" he takes, as a rule, better food; he marries earlier; he rears the children he has brought into the world with greater personal care; he tends the aged more thoughtfully; he takes better care of his poor; and he takes better care of himself. He does not boast of to-morrow, but he provides for it; and he holds tenaciously to all he gets. To our Saxon and Celtic eyes he carries these virtues too far; but thereby he wins, becomes powerful, and, scorning boisterous mirth and passion, is comparatively happy.

The special inroads on vitality made on other races by disease are not easily determined, because of the difficulties arising from temporary admixture of race. I tried once to elicit some facts from a large experience of a particular disease, phthisis pulmonalis, and as the results of this attempt may be useful, I put them briefly on record.

At a public institution at which large numbers of persons afflicted with chest diseases applied for medical assistance, and at which I was for many years one of the physicians, I made notes, during a short portion of the time, of the connection that existed between race and the particular disease I have instanced,—phthisis pulmonalis, or pulmonary consumption. The number of persons observed under the disease was three hundred, and no person was put on the record who was not suffering from the malady pure and simple,—I mean without complication with any other malady. They who were thus studied were of four classes:—(*a*) those who were by race distinctly Saxon; (*b*) those who were of mixed race, or whose race could not be determined; (*c*) those who were distinctly Celtic; (*d*) those who were distinctly Jewish.

The results were, that, of the three hundred patients, one hundred and thirty-three, 44·33 per cent., were Saxon; one hundred and eighteen, 39·33 per cent., were of mixed or undeterminate race; thirty-one, 10·33 per cent., were Celtic; and eighteen, 6 per cent., were Jewish.

It will be unfair to argue from these results that this proportion of Saxons suffering from pulmonary consumption, a proportion so extreme in comparison with the other races, is to be accepted as of general application. It may be conceded that of the persons who presented themselves before me the majority were Saxons, and that the numbers of them affected do but represent the relative proportions of the respective populations. Still the majority is large on the Saxon side, and to it ought to be added a considerable number of the class *b*, in which the precise fact of peculiarity of race could not be determined. Further, there was this noticeable feature, viz.—that amongst the Saxon patients three-fourths at least came with an hereditary or family history of consumption, while as regards the other distinct races the disease in every instance had apparently been acquired by the sufferer, and was independent of family proclivity.

In respect, therefore, to the particular malady named, I am led to infer that it is one to which persons of Saxon race are most susceptible. I am also led by other experience to think that the allies of this disease, struma, tabes mesenterica, and tubercular change generally, are most commonly met with in members of this race.

Physiological peculiarities may account for dispositions to disease belonging to typical classes of the human family. What these peculiarities are we are as yet unable to determine. Whether they are primitively impressed on a race, or are acquired, is a question that can only be answered when the exact relationships of disease to race are discovered. My own view is, that acquired and transmitted qualities, and specific existing social peculiarities, are sufficient agencies for the production of all the known variations of vitality belonging to particular races. This will be somewhat elucidated by that which follows in the next chapter.

CHAPTER III.

DISEASE ANTECEDENT TO BIRTH.

THE phenomena of disease may be pre-existent to the birth of the diseased individual, and that by the period, not only of one, but of two or more generations. To the ancients this fact, which was too obvious to be long overlooked, was an inscrutable mystery, incomprehensible on all physical grounds. It passed therefore, naturally enough, into an accepted order of events based, in simplicity and confidence of belief, on Divine will, without a thought as to the method of the ordinance or the cause of it. The sins of the parents were "visited upon the children until the third and fourth generation."

Some sins of parents are visited as diseases upon the children until the third and fourth generations; but there are other visitations, also descending through many generations, which are due, not to the sins but to the misfortunes or accidents of those in whom they originated and from whom they have descended. We are now obliged therefore, to modify the ancient hypothesis, and, by a careful study of the phenomena presented, trace out, as far as we have the light of scientific truth to guide us, the physical nature of such phenomena.

Diseases implanted in the living body previous to its birth are of two classes. In the one class the disease veritably exists in the body of the unborn, *i.e.*, is developed in the body while it is still in the womb of the mother. In the other class the disease, although it may pre-exist in the body previous to its birth, is not necessarily so far developed as to be recognizable at birth; indeed it may not be recognizable for a long time—for many years perhaps—after the body has been born.

The Phenomena of Disease of the first class.

The phenomena of disease of the first-named class are numerous and varied—almost as numerous and as varied as those which are manifested in the life of the being when it has attained to an independent growth and existence. They may also, while yet the being is dependent on the circulation of the mother for its support, be present while the mother is free of them, or while the mother is suffering from them.

These developed phenomena of disease, existing in the unborn, may be divided into groups.

The phenomena of disease which are most common to the unborn are those of a simple perversion of the nutritive processes. The body generally may thus be unduly developed in all its organs, so that it may attain to a weight even of twenty-four pounds avoirdupois. It may be unduly developed locally, so that such organs as the thyroid gland, the spleen, the tongue, the kidney, the bladder, the heart, may attain immoderate size. In the opposite direction, the body generally may be imperfectly nourished, so that at the period when its uterine life is fully accomplished, its weight may not even exceed three pounds. It may be imperfectly nourished in parts or organs only; or it may suffer from complete arrest of nutrition in the whole or in parts, and pass into a state of general or local decomposition.

A group of phenomena of an inflammatory character may occur during the intra-uterine life. There may be inflammation of the skin, of the mucous membrane of the lungs, of the stomach, of the intestines, of the eyeball; and such inflammation may be continued into ulceration. There may be inflammation of the serous membranes enveloping the spinal chord and brain, or of the serous membranes covering the heart, the lungs, the intestines, giving rise to the diseases known as arachnitis, pleuritis, pericarditis, peritonitis. There may be inflammation of the structure of organs, of the lungs, of the thymus gland, of the kidney.

Phenomena of disease consisting of exudations may interfere with the natural course of the child during its unborn existence. These exudations may be of blood, or of some constituent part of the blood. Thus effusion of blood has been found on the brain, in the lungs, and even in the cavity of the pleura; while effusion of the serum or watery part of the blood may take place between the membranes of the brain, into the ventricles, into the spinal canal, into the peritoneal cavity, into the cellular tissue beneath the skin, into the pelvis of the kidney, and into the pericardium or serous covering of the heart.

A considerable number of the diseases which are called communicable have been discovered as affecting the body during the time of its uterine existence. That one communicable disease which springs from vicious sexual indulgence, and which has insignificantly been called "specific," has been met with in the unborn in all its worst forms—affecting the skin, the bones, the glands, the organs of vision and of the other senses, and indeed invading the structures of the body generally, with as severe a malignity as it invades the tissues of those who in after life may contract it. Small-pox, another of the common communicable diseases, has been known to attack the unborn child; and what is most singular, the attack in some instances has occurred in the offspring, while the mother who was bearing it, has herself remained unaffected by the disease, though exposed to the contagion. This fact the illustrious Jenner has recorded with his usual accuracy of detail.

Of the other communicable diseases, measles and scarlet fever have shown themselves in the child, as contracted from the mother during the period of life that precedes birth, when the maternal organism could have been the only medium of impressions and influences derived from the outer world.

The phenomena of what are called new growths have been observed as developed in the unborn. These growths, tumours, have in some instances been simple in character, in other instances malignant. The simple growths include what are known as nævus, fibroid tumour, and cystic umour. The malignant growths include fungoid tumour, and that form of cancer recognized as schirrus or hard cancer. These diseases have appeared in the unborn child when the parents have been free of them, and even, as it would seem, of the taint of them.

Some organs of the child may be charged, during uterine life, with tubercular matter. The lungs have been discovered tuberculous with suppuration, a condition indicating a late stage of pulmonary consumption. Parasitic forms that have existed previous to the birth have been discovered in the body of the child. Hydatid cysts have been found in the kidney, and those small wire-like worms called ascarides in the lower part of the alimentary canal.

Various inorganic products have been noted amongst the diseases of the unborn. Calculus, or stone, has been discovered in the bladder. The surface of the skin has been found covered with a dark, reddish, gritty deposit. The same surface has also been seen covered with a scaly inorganic matter standing forth in tuberculated prominences, the skin itself being hard, thickened, and rent by deep irregular fissures.

Many forms of mechanical derangements and injuries have been traced out in the unborn child. The heart has been discovered with diseased conditions of its valves; the arteries have been found dilated; wounds have been met with on the skin; limbs have been detected fractured, joints fixed anchylosed or dislocated.

Irregular muscular movements have been known to occur in the unborn child. In instances where the mother has been suffering from ague the convulsive movements of the paroxysm have occurred in the child, but not necessarily on the same days as those in which the mother has been convulsed. Convulsion of an extreme and epileptiform character has also been known to attack the unborn and apparently to kill, the mother being unaffected. Again, irregular action of the heart has been traced as occurring to the child before its entrance upon independent life. I have myself known an illustration of this nature, in which a boy was born with his heart beating intermittently, a condition which has continued through many years of his life, and has, indeed, never ceased altogether, except during short intervals of time.

In addition to these active forms of disease affecting the unborn, there are sometimes certain modifications of structures to which we give the name of malformations. The absence of fingers or toes; the extra development of those parts; webbed fingers; marks on the skin; irregular growths of hair; distorted outlines of the bones, as in club-foot; distorted positions of the eyes—strabismus; these and some rarer disfigurements or failures of natural organs occur to the unborn during their brief first stage of unconscious life.

An arrested development of the more important organs of the animal, or a development originally imperfect, is yet another condition incident to the unborn existence. I have known a failure of perfect development in the globe of one eye, in one hand, in one lower limb, in the heart. In deaf mutes there is failure of construction either in the organ of hearing, in the nervous cord leading to the brain, or in the brain; in idiots there is primitive failure in the development of the brain as a whole.

Other failures of development are known which in their nature are simply fortuitous. Thus a limb may be subjected to compression from an accidental enfolding of it in a coil of the umbilical cord, and its nutrition may thus be arrested, even to complete destruction of its life.

The most common arrests of development are those occurring in parts where a junction of medial structures is required and is not perfected. Cleft in the palate; division in the centre of the lip—hare lip; division in the spinal column, with protrusion through the opening of the membranes covering the spinal cord—spina bifida, are illustrative examples of these abnormalities.

From malformation, or from an accident happening immediately after birth, the course of the blood is sometimes not properly directed into the new channel, it should naturally enter in order to support the independent life in perfect manner. In these instances the opening that exists in the unborn between the right and left sides of the heart, in the auricles, and which should commence to close so soon as the child commences to respire, remains open. The venous blood under these circumstances makes its way, in part, over the arterial circuit without first passing through the lungs, and the result is that the body, fed with a blood that is only partially aerated, is imperfectly heated. It lives from one and a half to two degrees below the natural temperature, and the appearance of its surface in its more vascular parts, as in the cheeks and lips, is of purple hue. The whole surface is preternaturally dark, and to the touch of a healthy person always cold.

Children thus affected are said to suffer from cyanosis. They die, as a rule, during their first years. I have known, however, one child that lived to seven years; I have known another that lived to twenty-one years; and a third, in whom the fault was but partially developed, who has lived to thirty-five years, and indeed is still alive and in comparative health.

The mode of death during cyanosis is, ordinarily, either by congestion of the lung or by the development of tubercle in the lung. All through their lives, cyanotic persons are disabled from taking active exertion; but they may live for a time in comparative comfort. They are not themselves conscious of feeling cold, although they enjoy artificial warmth; and they usually eat with appetite, and require food at frequent intervals. Their faculties are dull, but the sense of depression is not a severe, nor even a remarkable part of their disease.

These are the ordinary phenomena exhibited in persons in whom the opening between the right and left sides of the heart has been left unclosed after birth. At least one instance has, nevertheless, been recorded in which, through the open septum, the arterial blood has been diverted from the left side into the right side of the heart. In this patient the body was supplied with blood that was constantly superoxygenated,—with blood, part of which had traversed through the lungs twice before making the arterial round. The phenomena observed were those of breathlessness and palpitation on the least exertion, persistent and profuse perspirations yielding an intolerable odour, quick exhaustion on every effort, mental or physical; and an extreme deficiency of mental power. The patient in this condition was, in a word, like one subjected to overwhelming tropical heat,—nerveless, exhausted, and requiring perpetual rest from labour. In this marked case, recorded by the late Dr. Mayne of Dublin, the sufferer, who lived to become a woman, died suddenly a few hours after the mere effort of walking across a courtyard.

I intentionally omit all reference to those developments of the unborn known as monstrosities. This subject presents a field of singular interest to the physiologist. But as, up to the present time, nothing that suggests any useful measures for their prevention is known, respecting the origin and cause of these perversions of nature, the study of them would be curious rather than practical, and therefore out of place in this work.

In the brief first stage of life of the unborn, there occur to the body affections of a more refined kind, which are not immediately recognized, but which leave impressions that last throughout the after life. During this state of existence, the offspring, depending for its blood and for the force by which its blood is moved, on the circulation of the mother, is influenced by whatever directly influenced the maternal circulation. If any external agitation or passion make the heart beat unduly fast, or intermit, or for a brief period stop, the change of vibration passes to the child, which, unconscious though it be, is mechanically affected, its nervous matter being subjected to motion more or less determinate. The motion may be harmless, it may even be favourable to development, it may be prejudicial; whatever it be, it is imposed.

It has been assumed that certain direct mental impressions are communicated from the mother to her unborn child, as though the nervous connection existing between the two through the blood could be a medium of such communication of impression. The hypothesis is not unreasonable, but it is unsupported by any distinctive line of evidence. The extension of an influence through the circulating channels is fully supported by evidence, since we know that the complete arrest of the circulation of the mother is fatal to the child. It may be, therefore, that this influence is itself sufficient to account for phenomena of nervous disturbance extending from the maternal organism to the dependent organism; for whatever interferes with the supply of blood to the brain and other nervous structures, creates disturbance in their nutrition, and is a source of danger to their perfect development.

The Phenomena of Disease of the Second Class.

The phenomona of disease that are antecedent to birth, and are not marked by any developed evidences at the time of birth, constitute what are called the hereditary maladies. They all come from a condition that has been laid in the parental line, paternal or maternal. In some respects they are analogous with other hereditary qualities, such as the mental qualities of courage, fear, prodigality, frugality; or the physical qualities of shape of body, complexion, tone of voice, and feature. They differ from these qualities in that they are not of necessity present from the period of birth, but may remain for a time undeveloped, and indeed may not be developed at all unless some exciting and untoward influence call them forth.

We are as yet unacquainted with all the phenomena of disease that pass in the hereditary line, but we admit the following as proved:—Phenomena of scrofula or struma, of cancer, of consumption, of epilepsy, of rheumatism, of gout, of insanity, of cretinism, of albinism, and of the "specific disease"—syphilis; together with many varied attendant secondary phenomena, to which special names have been applied.

It would be wrong, however, to limit the hereditary proclivities of disease to the above list. Day by day we are learning that they extend much further, and that a new line for observation is thus indicated which, industriously followed out, promises to yield the most important results. The further my own investigations extend—of the present, from experience and experiment; of the past, from historical reading—the stronger is the impression made upon my mind that the majority of the phenomena of disease have a certain hereditariness of character. For instance, that phenomenon which we call intermittent action of the heart, I have found to be distinctly hereditary. I have seen a child who exhibited it at the moment of birth, and to whom it was traceable through two generations. The phenomenon in this case, nervous in character, is induced, as we shall see in the sequel, purely by mental shocks acting definitely, but in so refined a manner, on the heart, that we as yet know nothing of the physical change that is developed in the nervous matter. Again, I have known families in whom the tendency to some forms of communicable disease has been markedly apparent, and I have known instances of the reverse. Thus I have seen hereditary proclivity to scarlet fever and to diphtheria. I have also seen, in respect to one of these diseases (scarlet fever), hereditary opposition to it, if the term be allowable.

In brief, hereditary tendency means an organic construction of body, framed during uterine life that is favourable to the action of those external influences which, in their operation upon the animal functions, induced disturbed phenomena, —in other words, diseases.

Physical Seat of Hereditary Proclivity.

For ages past the hereditary proclivities to certain of the phenomena of disease have been recognized, and speculation has had its liberty in its endeavour to prove in what part of the animal body the fault is located by which such hereditary proclivity is manifested. Until lately, by the almost unanimous voice of learned and unlearned, the blood has been made the local seat alike of the good and of the bad qualities of the animal body. This hypothesis has found its expression in familiar terms: "The disease is in the blood," "the tendency runs in the blood," "ancestral blood." These and many other similar phrases are daily employed to express the hereditary peculiarities, mental and physical, of different families and of different men.

For this phraseology, and for the hypothesis upon which it is founded, there is no basis whatever of a scientific character. The blood may, it is true, be changed in quality in various ways. Its specific weight may be increased or reduced; certain of its constituent parts, as its fibrine, which should be evenly distributed through the volume of the fluid, may separate; its red corpuscles may be diminished in number or modified in shape; its white corpuscles may be increased; and not to mention some other changes, the blood may be charged with substances foreign to it, by which its natural properties may be impaired or even destroyed. These conditions, serious as they are when present, are of themselves to be considered as temporary. Certain of them may kill; certain of them may pass away, causing little mischief; and certain of them, in cases where they do not kill, may lead to injury in other parts of the body, the effects of which injury may be permanent and perhaps transmissible; but there is no disease of blood that is to be considered as directly transmissible in hereditary descent.

The phenomena of diseases that are truly hereditary are due, as it would seem from all modern research, to primary injury inflicted upon nervous matter. It can indeed now be proved from direct observation on the inferior animals, that certain injuries inflicted on the nervous system will produce symptoms which pass to the offspring of the injured as distinctly as if the mischief had actually been inflicted upon the offspring. Thus, epilepsy, induced by nervous injury, has been transmitted directly downwards in hereditary course. But in what manner the primary hurt passes from the parent to the offspring, and that too by paternal as well as by maternal line, is simple mystery, on which science merely speaks as yet to tell us that the fact must be accepted.

In only one direction does light dawn, in advance of this new and remarkable truth. It is observable that the injuries to nervous matter which are capable of producing hereditary diseases must, in the first instance, be inflicted on a nervous centre, or on the trunk of a nerve, and that no injury inflicted on the peripheral expanse of nervous matter, that expanse I mean on which we receive all the impressions that reach us from the outer world, is capable of being transmitted. Thus, while the effects of central injuries pass down, surface injuries and even amputations of extremities leave no mark on the succeeding generation.

CHAPTER IV.

EXTERNAL ORIGINS AND CAUSES OF DISEASE.

If it be true that the animal organism is intended by nature to pass through a cycle, and that natural death is not a disease, but a completion of the process of life, it follows that the organism, born in health, is constructed to pass through the cycle and is not of itself,—that is to say, by its own organization,—capable of giving origin to any of the phenomena to which we apply the term disease. We must, therefore, seek for origins of the phenomena in causes lying outside the body, and affecting it in such manner as either to render the natural actions and processes irregular, or to excite actions and processes that are altogether new.

Writing out in correct lists all the groups of phenomena that make up the term disease, and asking of each disease what is its origin, I find, as an invariable answer, that it is from without; a something, or a series of things, external to the body itself, but acting upon it or through it. From this point of view all the groups of disease are in truth accidents; exposures to some influence or influences that pervert function or create new motion. If I fall and break a limb by coming into collision with some resisting medium, the cause of the fracture is obviously external. If I take typhus fever, the cause is equally external. I have come into contact or collision with an external, injurious agent, and have borne a less obvious, but not less certain, accident. The same with the whole list of the phenomena of disease, however classified or described.

In the olden times, when each manifestation of diseased action was considered an entity; when to be epileptic or insane was, for example to be possessed of an evil spirit; the causes of the phenomena were left as inscrutable. The diseases were the direct and dire chastisements of a Supreme Power; to ask their natural origin were to court a superfluous or sinful labour. Even in these days this impression is not altogether absent in civilized communities; in uncivilized, where it has taken root, it remains unchanged.

It is not until we are brought to understand the physical design of the phenomena "disease," as opposed to the hypothesis of what has been called "visitation" and "entity" of disease, that we can move a step towards any attempt at prevention or removal of the phenomena. I shall therefore endeavour in this, and in succeeding chapters, to indicate the nature of the external causes which give the origins.

The most difficult point in the acceptance of any proposition on this subject has hitherto centered in those maladies which are known to descend from one generation to another. I have sought to remove such difficulty by showing that diseases of descent do originally come from an external impression, which, in however inscrutable a manner, is nevertheless transmitted onwards from one organism to another. Nor is it more mysterious, when we think over the matter, that the impression of disease should descend, than that life and organization and form should take the same descending course. The knowledge of such descent must increase our sense of responsibility towards the unborn, but it need not add to our wonder, nor to our perplexity. What evil I inflict on myself, what injury I inflict on others, may be transmitted to those who as yet are non-existent; what real good, physical or mental, I bring to myself, or to others, may also be transmitted to those who are yet non-existent. These are physical lessons better far to receive and act upon than the superstition, whatever its antiquity or authority may be, which places action out of our power.

For each of the individual groups of disease is there, then, an individual corresponding cause, lying apart from the organism, and influencing it? That is to say, are the causes as manifold as the diseases themselves; or are they limited in number, and only extended in effect, so that from one series of causes many manifestations of phenomena proceed?

The answer to this inquiry will probably be ultimately learned by the methods of tracing out the relationships of allied groups of phenomena, of reducing many apparently distinct groups to one type, and of discovering a common and distinguishable cause as the origin of that type. By these methods the naming and grouping of diseases, and the classification of causes, will be simplified and perfected.

The science of medicine is not yet sufficiently advanced to allow of such simple classification of diseases, in relation to their causes as is above suggested. The idea exists, I do not doubt, in the mind of every medical scholar, but it has not taken the form of an approved and scholastic character.

The nearest approach to classification of disease from cause is framed out in the returns of mortality issued weekly by our Registrar-General. Here, under the heads of "zymotic diseases," "developmental diseases," "accidents," there is an attempt at connecting disease with cause; but the attempt is partial only; a compound of the physical reading of the phenomena of disease, and of those old readings in which such phenomena were considered as visitations, sudden, inexplicable, and belonging essentially to the one corporeal organism in which they were manifested.

Withal there is a general, if unwritten, knowledge, that certain marked events of disease are often found occurring together, as if they depended upon some common influence. There are epidemic visitations. There are accumulated instances of sudden deaths from apoplexies, hæmorrhages, congestion of the lungs, failures in the motion of the heart. The operating surgeon has a long run of successful operations even of severe operations; then he has a long run of fatal operations, in which he knows that the severity plays no part in the general result. When we put all these facts together, though we even call them concidences, for the want of a better term, they point circumstantially to the limitation of the phenomena of disease, and to the dependence of these phenomena, however apparently varied, upon the operation of a few causes, active and external.

To this same suggested line of thought history lends her store. The external causes that give rise to the phenomena of disease have remained steadily in operation, producing repetition of the phenomena in such systematized order, that from patient study of history we might predict the recurrence of some of the phenomena, as astronomers predict the return of comets and the recurrence of eclipses. The causes have remained unchanged; the phenomena have followed with the precision of natural law.

In succeeding pages, without attempting any elaborate or minute definitions of disease as dependent upon cause, I shall endeavour to consider the phenomena as originating in the following four sets of causes :—

(1) Phenomena having their origin in causes which, in one or other form, are persistently present; are parts of the natural order of the universe; are inseparable from that order, and are therefore beyond human control. I refer to such causes as atmospheric pressure, temperature, electrical condition, storm, earthquake, lightning stroke.

(2) Phenomena having their origin in causes which, though springing out of nature in some unknown way, and though difficult of control, are, nevertheless, under an improving knowledge, controllable. I refer to such causes as pass from one person to another, and communicate from one person to another specific maladies. The diseases dependent on organic poisons,—communicable

diseases, and others not communicable, except by hereditary descent, as cancer, consumption, cataract, calculus, will come under this head.

(3) Phenomena of disease incidental purely to old age, and which depend on a cause uncontrollable, nay, one might say natural. I refer to the continued influence of the attraction of gravity upon the body; which influence, acting upon an organism destined to pass through a definite stage of development and developmental activity, remains in force after the maximum of organic power has been reached, and, still acting with undiminished force, at length slowly arrests nutrition, and leads to the degeneracy of senile decay.

(4) Phenomena of disease dependent on such causes as modes of life, and the self-imposed acts of a person or a community. I refer to overwork, to indulgence in injurious foods and drinks; to habits, exercises, studies, occupations, passions; to privations; to moral contagions; and to all causes born of free-will or desire—the controllable errors of social life.

In the great family of human diseases included under the above four divisions, the extremest differences of intensity and of severity of phenomena prevail. The phenomena that come

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under the *first* division are severe, and if we attach to them injuries of a secondary kind which often spring from them in their earlier stages, they are all dangerous. They yield a large return to the tables of mortality, and with such steadiness of rule and order that art seems practically powerless to arrest them in their sweeping course.

The phenomena included in the *second* division are also severe in character, but they are fluctuating, both in respect to periods of occurrence and severity. The great Plagues came under this head, and before them, when they have become developed, art again stands powerless. Happily, however, science has supplied art with the means to avert these phenomena in certain instances, and each day brings some new truth that helps on science in this splendid course. Other diseases belonging to this division, such as cancer and consumption, are as little under command; but inasmuch as the cause, even of them, may be connected with social errors, we may hope, as the errors are discovered, that science will find a way to their prevention if not to their cure.

The phenomena included under the *third* division are hardly to be classified as severe, even though they lead to the death of the individual in whom they are developed. They are the natural changes of organic function and structure incident to the prolonged resistance of life against death; they are as a rule painless, and, so far as we know, irremediable. Science here lends to art the means to soften such severity of suffering as may attend these phenomena; and science has been bold enough, in fits of unguarded enthusiasm and self-assertion, to look for means to meet and neutralize the phenomena; to make what has been called an art of "rejuvenescence;" to sustain the matured man in perpetual maturity; or to bring back the declining man to adolescence. In this effort her success, should she succeed, would be but a perversion of nature; she must needs then destroy the rejuvenescence of nature, the new physical birth, in order to sustain a race of old individualities; or, supplementing natural growth with renewed forms of growth, she must invent a new planet for the excess of life she would inflict.

The phenomena included in the *fourth* division are altogether social and controllable. They are often severe phenomena, they sustain a large mortality, and they impose a currency of suffering, which passes like a current account from generation to generation. Science has her duties in relation to these phenomena; she is bound to teach what they are, and how they may be avoided. The application of her teachings she must leave to the intellect, the sentiment, the self-interest of mankind.

The leading object of this work is to deal with certain parts of the fourth division of the phenomena of disease. To this subject I shall devote a special part of the volume. But before proceeding to it a chapter may, with advantage, be devoted, in the present part, to each of the first three of the divisions of disease to which attention has been directed.

CHAPTER V.

PHENOMENA OF DISEASE FROM CAUSES EXTERNAL AND UNCONTROLLABLE.

THE external and uncontrollable causes of disease may be called in brief, "meteorological." They include variations of season, of electrical tension, of temperature, of atmospheric pressure, of winds, of moisture, and of the chemical constitution of the atmosphere. They include, also, those sudden manifestations of natural force which subject the animal body to the accidents of lightning-stroke and sun-stroke.

The study of these causes in relation to disease, the most simple, the most natural of studies, has been set aside often for the sake of theories the most fanciful. We observe great outbreaks of disease, and we look for their primary cause. It is "epidemic influence," says one; it is an "organic germ," says a second; it is a "malarious influence," says a third; while the effect of simple atmospheric change is overlooked or forgotten.

Effects of the Seasons on Life.

Let me in the first place give a striking example, which cannot fail to be remembered when once it has been read, of the potent influence of meteorological changes on the body. The simple narrative embraces a remarkable natural discovery made by the late Mr. Milner, while he was acting as Medical Superintendent of the Convict Establishment at Wakefield.

The men under the charge of Mr. Milner, and on whom he conducted the observations about to be described, were between the ages of fifteen and sixty, were all in good health at the time they were observed, and were all living under precisely the same conditions. They occupied separate apartments for a period of nine months. They were fed on the same kind of food, were dressed in the same kind of clothing, and were made to take the same amount of daily exertion. Their rooms or cells had an equal cubic space, were ventilated alike, were charged with the same quantity and character of air, and were maintained at the same temperature, viz. at a mean of 61° Fahr.

The question determined by Mr. Milner was, whether a large number of men thus similarly circumstanced, would undergo any general organic changes under varying conditions of season and meteorological variation. The observations upon them commenced on the 1st day of January, 1848, and were extended to the 31st of December, 1857. The men were weighed on admission, and again at the latter end of every calendar month during their stay. The number weighed exceeded 4,000; the average number weighed monthly was 372; and the total number of individual weighings was 44,004.

I give these details because they refer to an experiment so great in its design and importance that it cannot be overvalued. Here were men living under the same conditions day by day, and so protected by rigid orderly care, it would at first seem that variations of organic life were all but impossible. The results controverted this supposition, and showed the existence of a series of organic fluctuations, marked as the variations of the seasons themselves, and extending through the whole mass of this living community.

In the first months of each year, January, February, and March, the bodies of these men underwent a gradual process of wasting, the loss of weight being as 0·14 in January, 0·24 in February, and 0·95 in March. The month of March past, a change took place; the body in each case began to acquire flesh, and continued to maintain this state until the end of August, the gain in each month being in the following proportions :—for April, 0·03; for May, 0·01; for June, 0·52; for July, 0·08; for August, 0·70. August past, there was again waste of body, which continued,—except during November,—from September to December, the proportion of loss being for September 0·21; for October 0·10; and for December 0·03.

The facts gained from this remarkable experiment are, that during the months of winter the body wastes, the loss of weight varying in an increasing ratio; that during summer the body gains, the gain varying in an increasing ratio; and that the changes from gain to loss, and from loss to gain, are abrupt, and take place, the first at the beginning of September, and the second at the beginning of April.

The lesson taught by the facts recorded above is, that we are all subjected to certain persistently recurring external variations which imperceptibly produce the most marked physiological action, even on the healthy body. The lesson becomes the more impressive when it is taken in connection with the prevalence of disease.

Correlative Effects of the Seasons on Disease.

To show the relationship of the diseases to meteorological conditions, I may briefly adduce a series of facts, in their way as curious as were the facts elicited by Mr. Milner. I took the returns published by the Registrar-General, and analysed the diseases causing 139,318 deaths occurring between the years 1838 and 1853. Then, concerning these diseases, I asked how far do they classify themselves with the seasons? The answer was singularly instructive.

Of all the disorders affecting the body, not one is better known or more generally extended, at certain times, than that called bronchitis. Turning, then, to my analysis, I find that the deaths from bronchitis attain their maximum during the months of January, February, and March; that in April, May, and June they decline; that in July, August, and September they reach their minimum; and in October, November, and December recommence to increase. The proportions vary in the following ratio per cent. :—In January, February, and March, 36·793; April, May, and June, 20·301 ; July, August, and September, 10·327; October, November, and December, 32·570.

Another disease hardly less known than bronchitis, I mean inflammation of the substance of the lung—pneumonia—affords a parallel series of facts. This disease as my tables show, has its maximum in the three first months of the year, its first decline in the succeeding three months, its minimum in the next three months, and its ascent towards the maximum in the last three months of the year. Thus in the first of these periods (January, February, and March), the percentage of deaths averages 37·022; in the second period (April, May, and June), 19·631; in the third period (July, August, and September), 12·324; and in the fourth period (October, November, and December), 33·521.

The disease called influenza—an extremely depressing cold, attended commonly with inflammation of some portion of the lung—affords similar data, with this variation, that the maximum of mortality from it is in the three last months of the year, instead of the three first. Thus the percentage of deaths gives the following averages:—In January, February, and March, 23·539; in April, May, and June, 12·71; in July, August, and September, 4·502; and in October, November, and December, 59·784.

The disease of children called croup, a disease of an inflammatory nature, in which the blood is specially disposed to undergo separation of its fibrinous part, and in which there is inflammatory exudation into the windpipe, and often separation of fibrine in the cavities of the heart itself, is another example. The mortality from this disease, I discover by my analysis, runs side by side, as to season, with bronchitis and the other allied maladies. The percentage of deaths yielded by it, stands, for example, in the following order:—

In the months of January, February, and March, a maximum of 27·523; in April, May, and June, a decline to 25·100; in July, August, and September, a minimum of 19·919; in October, November, and December, a rise to 27·456.

These observations were extended to many other severe diseases, viz. erysipelas, pleurisy, quinsey, and carbuncle, with the same results. They admitted of extension also—by another process of research—to that slighter, but important disease, catarrh, or common cold. For experience tells us that when the more formidable diseases named above are prevalent, catarrh is also prevalent; so that this affection, which is indeed often a premonition or a modified form of the severer types of disease, may be classified, in regard to its periods, with them.

The causes of disease now under consideration extend their influence to, certain other affections, which they do not produce directly, but which they greatly aggravate. Acute chronic rheumatism, gout, consumption, asthma, carbuncle, remittent fever, dysentery, diphtheria and, markedly, scarlet fever, are all diseases which, though independent in origin, are modified in intensity by the variations of season, nearly in the same order as those diseases which are directly promoted by meteorological influences.

How these meteorological conditions act upon the living body to produce disease is a question as yet too complex to admit of any solution that may be considered scientifically perfect. There are, nevertheless, some facts which, if they be put in the light of coincidence merely, are of singular interest, and which possibly stand near to the relation of cause. Thus we find during the periods when the diseases I have tabulated are most prevalent, the conditions of atmosphere then prevailing are characteristic of low barometrical pressure, with extreme humidity of the air, and with a temperature of from 45° to 50° Fahr. These, as experimental data show, are the precise conditions by which febrile heat of the body is most easily produced, and in which, consequently, the diseases named, marked as they are by fever as a leading symptom, are most easily called forth. They are conditions unfavourable to equalization of the animal heat by evaporation and radiation; and when we recall that during the seasons in which they prevail the body is actually consuming faster than it is at other periods, is in fact wasting and losing power, we have before us the predisposing elements, both for the independent outbreak of febrile phenomena, and for their intensification when they have been excited by other external agencies.

Effects of Electrified Airor Ozone.

Attempts have been made to determine the specific atmospheric influences which lead to the occurrence of catarrh and to the varied phenomena of disease that so peculiarly attend the course of the seasons. I have been led, with other observers, to inquire whether an electrical condition of the atmosphere can in any way exert an influence in exciting the phenomena. It is worthy of notice, in touching on this subject, that during the seasons specially characterized by the phenomena of disease we are now considering, there is an increased electrical tension. Further, during these same periods there is frequently present that electrified form of the oxygen of the atmosphere to which we apply the name of ozone. It is only since the discovery of ozone we have been able to understand how the influence of atmospheric electricity can be exerted on a living animal body so as to lead to disease; and it is, therefore, of importance to record what ozone will effect. In the year 1854, in a conjoint paper communicated to the Epidemiological Society by Dr. Moffatt and myself, we showed that with certain of the winds there are periods of ozone, and that these periods correspond with those seasons in which there is an increase of the number of febrile diseases, Since then my learned friend has sustained the argument with great assiduity and force of evidence. I have on my part investigated the physiological action of ozone, and, at the meeting of the British Association for the advancement of Science held at Birmingham in 1866, I related the results of that investigation. I showed from experiments of inhaling ozone, made on myself and on Dr. Thomas Wood, that ozonized air would produce, under proper conditions, a distinct nasal catarrh, accompanied with pain in the forehead, with hoarseness, and even with irritation of the throat, as in sore throat from a cold. I showed by other experiments of a similar kind performed on inferior animals, and carried to a more extreme effect, that carnivorous animals are more susceptible than herbivorous to the action of ozone, and that in the *carnivorous*, exposure to ozonized air produces congestion of the lungs, bronchial irritation, the formation of a tenacious mucus or phlegm in the bronchial tubes, and a condition of the blood in which the red corpuscles coalesce with great rapidity and adhesion, as in inflammatory affections generally. In the same line of research, I have discovered that these physiological effects of ozone are destroyed by heat; that they cease at 75° Fahr., and that they are most marked in a lower temperature when the air is charged with moisture.

It would seem on the first glance at these facts, that a connection of cause and effect, between electrified oxygen in the air and certain common diseases, was proved. The connection is not proved, but it is very strongly suggested. The difficulty of proving lies in the process of testing for ozone in the air, for the phenomena of the diseases are often present when, according to our known tests, the assumed producing agent is not detectable. Again, although outbreaks of the phenomena of disease are, as a rule, very general, they are not by any means universal; more persons escape than suffer,—a fact which conveys the suspicion that an agent generally diffused and breathed by all alike could not be at work without influencing all alike. It is but just to point out these difficulties, although, perhaps, they are temporary. It is probable that ozone exists in the atmosphere at times when we cannot detect it by our physical tests, and that certain persons are more susceptible than others, to its influence, as certain of the lower animals are more susceptible than other animals, carnivora than herbivora. It is equally probable that the ozone produced in the atmosphere, in electrical storms, may not be diffused equally in the atmosphere, but in lines or local currents — stratifications, I might say—so that it may influence none but that limited number of persons, or that limited number of tests, which lie in the course of its current.

Finally, on this particular point I am satisfied, from direct observation of the fact, that there are brief ozone periods localized in limited parts of the atmosphere, and affecting limited areas of terrestrial surface,—just as there are short and local electrical storms,—which may in one particular locality inflict much injury, and at the time be unknown elsewhere. In addition there are probably ozone periods when the activity of the ozone is modified by temperature. I found in inhaling air charged with ozone that the peculiar effect of the agent to produce catarrhal symptoms was lost when the temperature was raised to 75°; and I found that this same neutralization of its action occurred to animals breathing the agent in a still more concentrated form than I could breathe it, when heat was introduced. Heat, therefore, tends to destroy the special influence of ozone on animal organisms, and as, when the agent is present in the air, different persons are subjected to it under extremely different conditions of temperature, it is perfectly consistent that some should suffer and some should escape from its influence, even though it be widely diffused.

From the whole of the evidence before me, I am led to the hope that in course of time we shall understand the nature of the external and uncontrollable causes of the diseases included under the names of catarrh, bronchitis, congestive bronchitis, congestion of the lungs, pneumonia, influenza, croup, and other of the inflammatory maladies which we commonly assign, in respect of origin, to cold or catarrh. Nay, I think we may indulge in the expectation of being able one day to predict, from defined meteorological readings, outbreaks of these diseases, and to forewarn the community of the dangers by which it is threatened.

Another subject of inquiry is opened to us in respect to an opposite condition of the atmosphere from that which is produced by electrical action upon the oxygen. In some researches I conducted on the inhalation of oxygen gas, I observed that if an animal were made simply to berathe an tamosphrea of pure oxygen gas, although the oxygen were perfectly cleared of the the products of the combustion of the animal, it would not sustain life, but would allow the animal to fall into a somnolent condition and to die. But if electrical discharges were passed at intervals through the oxygen, or if it were kept at a temperature above 75° Fahr., it would continue to sustain life.

In another series of experiments I learned that if oxygen were freshly made, and passed in the fresh state through a chamber in which living animals were placed, the animals would continue to live. But if the oxygen that had swept through the chamber,—although it were thoroughly purified of animal products and although it still appeared to be absolutely pure oxygen,—were used again, it failed to sustain life until it was subjected to the action of the electric spark, when it regained its activity.

I infer from these observations that oxygen may exist in the atmosphere in an inactive condition, not inducing, necessarily, acute disease, but depression of mind, languor, torpidity, and cachectic feebleness of body.

Effects of Atmospheric Temperature.

The influence of meteorological changes is often felt in a still more simple manner than that stated above. Upon a large number of our population, the mere action of cold, occurring from a sudden fall of the atmospheric temperature, strikes with telling effect. Thus, if we notice the results of a rapid decline of temperature on the mortality of persons of different ages,—after the manner in which the facts have been observed and commented upon in the English returns of mortality by the Registrar-General,—we find that sudden decline of temperature leads to a mortality based on a given rule in relation to age. In persons who have not passed their thirtieth year, the effect of the cold is not indicated by an increase of mortality; but on those who are at or above thirty the effect is so definitely developed, that the mortality doubles with every nine years of life. For example, if the decline of temperature be sufficient to kill one person who has reached the age of thirty, it will kill two who have reached thirty-nine, four who have reached forty-eight, eight who have reached fifty-seven, sixteen who have attained sixty-six, thirty-two who have attained seventy-five, and sixty-four who have arrived at eighty-four years.

We find an explanation of these effects of cold in the simple estimate we have already formed as to the force of vitality at different ages. We have assumed that the body reaches its maximum of development at the age of thirty. At this period, if it be quite healthy, it generates by its own chemical processes so much force as shall enable it, within given bounds, to work its own machinery, to call forth, at will, a limited measure of extra force, and to supply a fluctuating loss that may be conveyed away by contact with the surrounding air, and by other bodies that it may touch, and that are colder than itself. The body yields, therefore, applied force, reserved force, and waste force; and these, under ordinary circumstances, are sufficient to maintain the perfect organism in effective life. So much active force gives the body the power to perform so much labour; so much reserved force supplies it with the power to perform a measure of extra labour to meet emergencies; so much waste force enables it to resist the external vicissitudes without trenching on the supply which is ever wanted to keep the heart pulsating, the chest heaving, the glands secreting, the digestive apparatus digesting, and the brain receiving or thinking.

Let this distribution of force be disturbed, and straightway the life-power is reduced. If we use the active force too long, we become exhausted, and call upon the reserve; and if we still continue the process we fail at last, unless sleep forces itself upon us and brings, with the rest it ensures, renewal of power. If, again, we are robbed of the waste force quicker than we can supply it, exhaustion is produced; inefficient nervous control over the vascular canals succeeds, and therewith that congestive condition of the lungs and other vascular organs, under which death is so easy when exhaustion is severe.

That the exhaustion should be more rapid in the man who has reached his prime is but natural. In his past he has been a growing, developing body, and in the course of development he has used up an excess of force commensurate with the demands of his growth. When he stops in development, and stands on a fair level with the external forces that are opposed to him, then his own force, for a short time balanced, soon becomes second in command. He feels cold more tenderly; if his rest be broken, his demand for artificial heat is urgent; if he lose or miss food, he fails rapidly; and, returning to our facts on the influence of external temperature on mortality, these many sources of failure are the reasons why a fall in the thermometer sweeps away our population so decisively according to its age.

As a matter of course, this external and uncontrollable cause of disease, as it affects even the healthy middle-aged man, still more disastrously affects the unhealthy. Has the man a weak point in the vessels of his brain? Exposure to cold renders that point more liable to pressure and rupture, with apoplexy as the consequence. Is he suffering from bronchial disease? His evils are doubled. Has he a feeble worn heart? It sinks under the strain put upon it. Has he enfeebled circulation of the kidney? He is threatened with complete obstruction. Is he indifferently clothed and fed? He is subjected to intestinal congestion and diarrhœa. It is from this extent of action of sudden fall of temperature, that the mortality of all diseases runs up so fast whenever such sudden fall occurs. A physical accident, though it might be more obvious, could not be more decisively fatal.

Effects of Atmospheric Pressure.

Variation in the atmospheric pressure exerts an influence on the animal functions which, up to the present time, has been but imperfectly studied. The common observations of mankind have led to the knowledge that a fall of the barometer is attended often with aches and pains in joint and limb. These pains are called, usually, rheumatic or neuralgic. Recently, light has been thrown over this subject by the experience gained of the effect of atmospheric pressure on men who are employed to work in "caissons," the tubes or coffer dams in which are laid the piers of bridges. The men in the "caisson" descend into an atmosphere where the pressure may be increased from ten even to thirty pounds to the square inch. While thus working they suffer little, albeit their venous blood is made preternaturally red, and an undue weight is borne by the exposed surfaces of the body. But when they escape from the pressure and come into the free air, their troubles begin. They are subjected then, in a greater degree, to those minor sufferings which we, who live in the freer air, feel when the barometer falls. They endure rheumatic pains in their limbs, severe neuralgic pains, and sometimes paralysis.

In our ordinary existence we are never exposed to so extreme a variation as is here referred to, neither are we subjected to such severe consequences. Nevertheless, the effects we experience, in what may be called the natural course of events, are of moment. With those in the free air, as with those in the caisson, the effect of variation is felt when the pressure is lightened. Then the compressed fluids and gases within the body undergo expansion; and what is experienced thereupon, is tension from within the body, outwards. There is pressure of blood, pressure of the vapours and gases within the blood, and probably, as I have shown in an essay on "*The Theory of a Nervous Ether*," pressure of a still more refined fluid, or vapour, which forms an atmosphere permeating and surrounding the ultimate particles of the nervous matter.

The effects of reduced pressure are sufficient to tell with unmistakable force on large numbers of our populations. The pressure of blood on the brain disposes to apoplexy in those in whom the vessels of the brain are enfeebled; the pressure of blood on the lungs disposes to congestion, and even to hæmoptysis, in those who suffer from lung disease; while the effect of the pressure on the nervous system is most strikingly evidenced in the pain, rheumatic, or more correctly neuralgic, which is experienced in those who are prone to such nervous derangement.

In the course of acute diseases, especially in diseases of a congestive character, the influence of the atmospheric pressure is found, when it is carefully observed, to be most significant. I have of late years compared, day by day, the barometrical readings with the phenomena of disease which have come under my notice. I believe that the symptoms of every form of chest disease, and of phthisis pulmonalis particularly, are most severe when the barometer is low; in other words, when the atmospheric pressure is reduced. Cough is then more frequent, pain is intensified, and loss of fluid from the body, by an excess of secretion, is increased. The symptoms of other diseases also are intensified by the same atmospheric condition. In persons who are suffering from rheumatic disease the pain is more severe; in those who have irregular circulation through the brain, the tendency to giddiness and vertigo is more easily developed. In those who are subjected to inflammatory fever the local inflammatory changes are quickened. I have specially pointed out in another work that the results even of surgical operations are unfavourably modified; and Dr. Addinell Hewson, who has registered, during a period of thirty years, the mortality from surgical fever, in the Pennsylvania Hospital, has shown it to be as 10·7 per cent. with a rising, 20·6 per cent. with a stationary, and 28·4 per cent. with a falling barometer.

Effects of Moisture, Winds, and Atmospheric Chemical Changes.

A great deal has to be learned on the subjects suggested by the terms, moisture of the air, winds, and chemical changes in relation to disease. There are as yet no data that show connected or regular series of facts between these influences and the phenomena of disease. A few general truths are, nevertheless, known.

That an air saturated with moisture is conducive to the development of rheumatic disease, and to the organic diseases of the heart which spring from rheumatism, is an admitted experience: that the same condition of the air favours the development of phthisis pulmonalis is equally admitted. It has been presumed, moreover, on fair evidence, that certain of the malarial fevers, supposed at one time to depend upon a specific malarial poison, are induced by exposure of the body for a long time, and especially during sleep, to moist air in low, damp buildings, or in marshy grounds. I have myself seen all these developments of disease from such exposure of the body to air charged with water vapour, but I have no precise knowledge, derived either from experiment or experience, of the degree of saturation at which danger becomes imminent; in fact no one has succeeded in separating all other causes, such as electrical action, heat and cold, and atmospheric pressure from this one and particular cause—moisture.

That certain winds are provocative of certain symptoms of disease, and that they intensify certain symptoms in those who are suffering from disease, is a part of universal, as well as of medical knowledge. Thus the south-west wind is known to be unfavourable to acute inflammatory conditions; the north and north-east winds to neuralgic and rheumatic conditions; while the drying, cutting, depressing east wind is fatal to those in whom the store of vital energy is very low. But here again we are wanting in method for determining the precise part played by the winds as causes of disease. It is not obvious that the winds determine the origin of any disease; and whether they intensify any by a special action of their own, independently of heat, cold, moisture, electrical tesnion, and other such active influences, remains to be discovered.

It has been surmised that during some great perturbations of Nature, changes may take place in the chemical constitution of the atmosphere, and that these changes may account for phenomena of disease. The passage of air over certain soils has been considered sufficient to disturb its natural chemical state, and to render it directly noxious to animal life. In the Grotto del Cane, and in some other rare positions, the air becomes sufficiently admixed with a poisonous gas (carbonic acid) to render it dangerous to breathe; but beyond these exceptional and well-known instances, we have no proof whatever of any such modification of the chemical constitution of the atmosphere as would provoke a special disorder. We have seen that the oxygen of the atmospheric sea may be changed in physical quality, and with effect on life. Beyond this we have no light. To all our present experience the chemical combinations, or more correctly, admixtures of the gases that make up the atmosphere,—of the oxygen, the nitrogen, the carbonic acid, and the ammonia,—remain always steadily balanced and fitted to support, without danger, the vital processes. The diseases which spring from vitiation of atmospheric air, from undue removal of oxygen, from introduction of carbonic acid or other poisonous gas or vapour, are, therefore, artificial dangers, invented and promoted by our own hands, and belonging consequently to the phenomena of disease embraced in our fourth class as phenomena due to the controllable errors of social life.

Effects of Lightning-stroke and Sun-stroke.

The natural accidents of lightning-stroke and sun-stroke, both singularly akin to mechanical shock, in their mode of action on the body, produce, when they are not immediately fatal, varied kinds of nervous disturbance. After lightning-shock there has followed, in some instances, a fever of reaction, in others, an apoplexy, in others, paralysis, and in still others, blindness. The most singular result of lightning-shock, however, is the disease known as catalepsy, which sometimes, though very rarely, has occurred. In this disease the patient is left, to common observation, as if dead, while his own consciousness remains alive. He can receive impressions from the outer world, but he cannot act in response. He is as a man in whom the power of volition has been struck out. In one of my lectures on this subject, published in the "Medical Times and Gazette" in 1869, I have related the history of such a case, which runs briefly as follows :—A man riding in a cart with two dogs, during a severe thunderstorm, was enveloped in lightning. One of the dogs was killed immediately, the other was blinded; and the horse was so severely struck that it died ultimately from wasting and general paralysis. The cart also was injured. The man was struck, but whether or not he was rendered unconscious, at the moment, cannot be ascertained. If it were so, he recovered, and was able to get to his home, which was a mile or more distant. He reached his bed extremely ill, could not take food, became emaciated, and at last sank into the condition of catalepsy. In this state he was thought to be dead; was laid out, and was tolled for in due order. He himself knew all this, and heard the passing bell. Impressed with the belief that he should be buried alive, he succeeded by a desperate effort in moving one of his thumbs. The motion attracted attention; he was treated as if still alive, and recovered.

A phenomenon after lightning-shock has been a decomposition of some of the animal secretions, from which has sprung a peculiar sulphurous odour. In the man whose case is recorded above this phenomenon took place; and Gaultier Claubry experienced it himself while recovering from the effects of lightning-shock. Claubry calls the odour that of "gas hydrogène sulfuré"—sulphuretted hydrogen gas—also "hepatic odour and taste." He said it exhaled from all his excretions, and was intolerable. Lastly, convulsive seizures and epilepsy have been known to follow the effects of lightning on man.

Sun stroke, a wave of heat striking the body suddenly like a mechanical blow, leads to similar diseases as the stroke of lightning. A peculiar coma-like apoplexy is one of the conditions that may follow; a frequently—recurring giddiness or vertigo is another; epilepsy is a third form of malady from this cause, and paralysis a fourth.

In all these examples of disease from the extreme shocks of lightning, heat, and, I might add, of mechanical shocks, the injury inflicted is upon the nervous matter. Sometimes the injury is on the brain, sometimes on the spinal cord, sometimes on the peripheral expanses of the nervous structure, sometimes on the nervous cords, and sometimes on the ganglionic nervous centres,—those centres which minister to and uphold the vegetative or organic life. The phenomena of disease that follow depend on the part of the nervous organism that was accidentally stricken, and their permanency depends on the extent of the injury that was inflicted. On the physical nature of these nervous injuries I have endeavoured recently to throw some new light, by showing that the nervous matter contains a colloidal fluid which becomes pectous (thickened or coagulated) under vibration from shock, and that its active properties are, in this state, temporarily or permanently destroyed.

I have spoken of the causes of disease described in the present chapter as uncontrollable; they also may be considered as persistent, because they periodically recur; and they may be considered as inevitable, because they constitute a part of the grand scheme of the universe. The diseases they excite were probably the first to which the human family was subjected, and will probably be the last.

CHAPTER VI.

PHENOMENA OF DISEASE FROM CAUSES EXTERNAL AND COMMUNICABLE.

THE phenomena of disease to be studied in the present chapter are brought about by the primary action of a series of causes which lie external to the body, and which, though they appear obscure, and indeed are derived from nature without the intervention, I mean the conscious intervention, of man, are even now partially, and may in time be absolutely, under his control. The phenomena are chiefly those included under the names of spreading diseases—plagues or pestilences—diseases, that is to say, which pass from one person to another by means of something given off from the afflicted that communicates them to the healthy.

These diseases, which I shall call the communicable, the acute scourges of mankind, are, from the sudden havoc they occasion, the most appalling. They strike us as being, beyond all other kinds of fatal dangers, unnatural, for they spare least of all the young. They attack the rich as well as the poor, the palace as well as the shed. In the infantile days of human intelligence and learning, and even down to these days, they have been likened, in mysterious and supernatural language, to earthquakes and great storms. They have been accepted as messengers of Divine wrath, coming and going like the winds, no one knew where from, or whither onwards. Now the learned are all but unanimous in looking upon them as due to the distribution of organic poisons; poisons which act only by coming into contact with living beings susceptible to their influence, and which may, in time, be limited in their action or altogether suppressed.

The diseases coming under this head are fairly known and defined; they include, with others, smallpox, cowpox, measles, scarlet fever, diphtheria, typhus fever, typhoid fever, hooping cough, erysipelas, hospital or pyæmic fever, diarrhœa, cholera, yellow fever, glanders, hydrophobia, syphilis, and infectious ophthalmia. I might add also to this class, affections arising from the bites of poisonous animals, as of the cobra di capello and other venomous reptiles. There is indeed so close an alliance between the secreted poisons of venomous animals and the poisons of the organic diseases, that the physiological action of the latter may be usefully studied from the former.

The Poisons of the Communicable Diseases.

Much discussion has taken place on the subjects of the nature and the origin of the poisons by which the communicable diseases are produced and propagated. These subjects have been to me matters of investigation for more than twenty years. I shall venture therefore, even at the risk of repeating what I have often published and spoken, to narrate the conclusions which by experiment and experience I have been led to accept as nearest to the truth.

The poisons are in every case specific in their nature and in their mode of action. Each one has the specific property of always bringing forth the same disease, when it excites disease, from age to age. From the time when man was first attacked by the diseases dependent upon these poisonous agencies, on to the present time, each of the diseases that has appeared has been developed from, and has depended on, one specific form of poisonous particle.

The poisonous particle in every case is organic in its character, whether it be considered as a chemical or a physiological product. It belongs, that is to say, to particular matter connected with living organization, as organic structure. Thus it differs from those inorganic poisons which often accompany it and are the cause of offensive odours, such as sulphuretted hydrogen, or sulphide of ammonium, bodies, which, though they are in themselves poisonous to living beings subjected to them, are not poisonous in the sense of being infectious poisons—poisons, I mean capable of exciting a disease that can be transmitted, by communication from one individual to another. The organic particles, indeed, differ from the inorganic in that they are less easily diffusible, are much more concentrated, and are inodorous.

The type of a disease producing organic poison is well represented in the secreted poison of a venomous snake. Such an animal may well be likened to a person suffering from an infectious malady, with the difference, that in the venomous animal the poison is always being produced, while in the infected person the poison, whatever group it may belong to, is present only during the time when he is suffering from the particular disease the particular poison has excited.

When we draw the virus of the venomous snake from the glandular structure in which it is formed, we find it of fluid quality. It is miscible with water; diffused through water it may be carried off, at a raised temperature, in vapour; or it may be dried down into a solid form; in all of which stages it may retain its activity. These physical qualities belong, probably, to each of the organic poisons. In the virus of smallpox, the correspondence is most perfect, and I found it equally so with a poison I succeeded in separating from the peritoneal secretion of a patient suffering from surgical fever.

The particle of a specific organic poison that may produce a disease is infinitely minute, so minute that we have not yet determined the precise point of division at which its power ceases. There is, nevertheless, a limit, which, once passed, is absolutely effective in stopping the influence of the agent. This fact was well brought out in the last century by Dr. Fordyce. Fordyce, speculating on the possibility of modifying smallpox by the process of inoculation, conceived the happy thought that he might mitigate the disease by inoculating with virus diluted with water. He therefore inoculated patients with diluted solutions of variolous matter whereupon he discovered the singular fact, that up to a given point the dilution of the poison had no effect whatever in mitigating the intensity of the disease, but that at a certain degree of dilution the activity of the poison was arrested altogether, so that no symptoms followed the inoculation. From its capacity for the reception of water, which is extreme, the poisonous matter reaches, at last, a point of dilution at which, probably, its organic constitution is changed: it then loses its specific power of exciting disease.

In the course of some diseases the poison is separated by nature in an exceedingly pure and active condition, and shows, in the different modes by which it produces its effects, that it is capable of being carried or distributed in the various conditions of matter known as the gaseous, the fluid, and the solid. This fact is peculiarly well illustrated by the virus of smallpox. It has been proved that in the early stages of this malady the poisonous product may pass off in the volatile form, may saturate articles of clothing, may be communicated again in the volatile form from such clothing to a healthy animal, and may thus propagate the disease. That the virus is very active in the fluid form is proved by every case of inoculation in which the fresh matter, carried on the point of a lancet and inserted into a healthy body, produces the specific disorder. That the virus may be dried down to the solid form and yet retain its activity is equally well proved by the fact that, so prepared, it will still act, by inoculation. These same rules would, I believe, be found to apply to all the poisons of the communicable diseases if we could bring them under observation with the same facility as we can bring the virus of smallpox.

I have said that the specific poisons are destroyed by extreme dilution with water; they are destroyed also by heat, but at no degree under 212° Fahr., the boiling point of water, and it may be not all of them at that degree. They are destroyed by some chemical agents, viz., by moist ozonised oxygen, by pure chlorine, by iodine, by bromine, by nitrous acid gas, and by sulphurous acid. I infer, moreover, that they are destroyed by sunlight, for I found this to be the fact in the case of the poison of the cobra. On the other hand, they are preservable. Extreme cold, especially when it is combined with dryness, maintains them, for an unlimited time, in their active state.

Some of these poisonous particles seem to require a special external temperature in which to display their action upon the living body that is exposed to them. Thus the poison of yellow fever requires a high temperature, and the disease it excites belongs, consequently, to tropical regions. The poison of typhus fever, conversely, is most active in a lower temperature, and the disease it engenders belongs to temperate regions of the earth,

For the distribution of the poisonous particles from animal bodies charged with them, the living action of the infected subject is required. In the dead subject the poisons themselves are not inert; but the dead body is not contagious because it requires the heat and the processes of evaporation that are proceeding from a body still alive, for the poisons to be disseminated to supply contagion.

The organic poisonous particles may travel in different ways so as to reach and infect a healthy body. They may be wafted as dry, solid, but fine invisible matter, and may be thus breathed or swallowed. They may be carried on articles of clothing; they may travel in water, in solution, or in vapour of water, in the air.

The organic poisons enter into the body by various ways, but always by contact. The poisons of measles, scarlet fever and typhus, are perhaps inhaled only, that is, taken in by the breathing apparatus. The virus of smallpox may be inhaled, or may be inoculated. The poisons of diphtheria, glanders, erysipelas, hospital fever, and ophthalmia, resemble closely the virus of smallpox in this same respect. The poisons of typhoid fever and of cholera appear to enter the body mainly in solution and by being swallowed.

The poisons of the communicable diseases are controllable. This is proved convincingly by one striking example, the control of smallpox by the process of vaccination. It is proved again by the success that has attended the attempts to stamp out the infectious disorders by isolation of the infected, and by prompt disinfection or destruction of articles of clothing which have been charged with the poisonous particles. But we have to wait for science to point out to us the precise nature of the poisonous particles, and how many are the varieties of them, before the triumph of control can be considered complete.

Origin of the Poisonous Particles.

Of the origin of the organic poisonous particles we have no fact sufficient to establish anything more than an hypothesis, and even hypothesis is uncertain and varied. Recently, speculation has run high on what has been called the "germ" theory, which has supposed each specific poisonous particle to be a living germ that can multiply in the affected body indefinitely. But no one has ever seen a germ, and no one has ventured to define between the germ of typhus, the germ of smallpox, or of any other specific disorder. Moreover, no one has ventured to explain why the living germs, having once commenced to propagate in the body, should not continue to propagate, until in every case they should kill their victim.

For my part I can see no basis for the germ theory as applied to the spreading diseases, except a barren analogy that these diseases may originate like plants or animals. This argument, purely defensive, explains none of the manifold phenomena which mark the character and course of spreading diseases.

The hypothesis I would myself advance, and which for many years I have consistently maintained, is — that these organic poisonous particles are derived from the secreted fluids of animal bodies themselves. In a word, a person suffering from a communicable disease is producing, by secretion, an organic substance, which, coming into contact with a healthy and susceptible person, in the right way, will reproduce itself and the disease that attends such reproduction.

On this view, the variety of the poisons depends on the variety of the animal secretions, each secretion of the animal body being susceptible, by contact with a poisonous secretion, of change also into a poisonous secretion. Thus the virus, once established in a secretion, is promoted through the secretion, and is ultimately eliminated by it, if life be spared for a sufficient time to ensure elimination.

I have tried, and others following in the same line of research have tried, to isolate these organic poisons, and to determine their precise chemical nature. In one instance I succeeded in separating from the poisonous matter exuded from the peritoneal secretion of a patient labouring under surgical fever, a substance which would give a similar disease to an inferior animal, and would reproduce in the secretions the same virus. I named this substance "septine," and I expected it might be again obtained in larger quantities and be submitted to analysis; but I have not hitherto realized this expectation.

The Question of the Spontaneous Origin of the Poisonous Particles.

Bearing upon this subject of scientific research, there again crops up the influence of atmospheric changes in the production and distribution of the poisonous particles. I believe,—though the proof of the belief is, I confess, difficult,—I have seen a spontaneous development of a disease allied to diphtheria, and which differed only from diphtheria in that it was limited to one patient. I have seen the same fact in relation to scarlet fever, and have described a special form of this disorder, under the name of idiopathic, or "doubtful," scarlet fever, in which every symptom and every fact was characteristic of the true disease, except that the patient was never exposed to the fever poison, and did not communicate poisonous matter. I am equally satisfied that I have seen surgical fever,—the fever which follows upon surgical operations,—originate in the same manner, that is to say, spontaneously, and afterwards become contagious. These illustrations could be multiplied, and could, perhaps, be extended to all the diseases that depend for their origin on an organic poison.

If, then, the view I have propounded—that the poisons themselves are the modified secretions of the living animal—be true, we may attribute the change that produces them to the effects of external atmospheric conditions, or to changes induced in the animal body itself by nervous perturbation or shock: for we know that modifications of organic fluids and varied phases of their decomposition are directly promoted by the same external influences. In the dog suffering from rabies, it is, I think, beyond dispute, that the poison in the saliva is developed, in some cases, spontaneously through the influence of rage or fear.

It is all but proved to demonstration, that in the human body, in the absence of acute disease, secretions may be produced which become poisonous and capable of promoting communicable diseases. Under famine the secretions are rendered pestilential, and hence the origin of the term "famine fever." In proof of this same view, of the origin of a contagious malady from a morbid animal secretion, spontaneously developed, there is on record the remarkable fact that the secretion of the hand of an accoucheur communicated puerperal fever to his patients, the possibility of the communication of a specific particle from one infected person to another being to all conceivable evidence excluded. With infinite candour this practitioner tells us that the first case of the disease arose "spontaneously" under his care; that other cases followed; that he left home, travelled, and returning to his practice again, communicated the same contagion from the secretion of his own hand.

To repeat the question:—Whence came these organic poisonous particles originally? I answer, from the diseased animal organism itself. I suggest that lower animals or men have been sometimes placed in such untoward conditions that their secretions have undergone the organic change by which they have become poisonous. In this way we see a simple mode of origin for these external factors of plagues, an origin which gives the specific basis for each specific pestilence. Nay, I think we may go even a step further. I believe it possible, from a striking fact I once observed, that through a mental impression the nervous element of secretion in man may be so modified that a fluid shall be secreted of specifically perverted and poisonous quality.

One more striking fact (already touched upon in page 39) deserves to be recalled; namely that certain individuals are by proclivity either disposed or indisposed to the action of the organic poisons of the communicable diseases. Thus during an epidemic say of typhoid fever or of scarlet fever, or of diphtheria, we physicians see constantly a family tendency of susceptibility or of unsusceptibility to the prevailing disease which would be inexplicable did we not recognize that, to the presence of the poison causing the disease must be added the peculiarities of the individual. These peculiarities, idiosyncrasies as they are technically called, are not wholly shown through the effects of the refined organic poisons of which I have been speaking: they are seen also through the effects of some ordinary poisons and in the most marked degree.

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The Phenomena of Disease induced by the Organic Poisons.

It were apart from my purpose to enter into details of the special phenomena of each of the communicable diseases. I shall simply deal, therefore, with the prominent phenomena which may be said to be common to them all.

1. For the development of each of the diseases, a certain period of "incubation," as it is termed, is required. This includes the interval

between the introduction of the exciting poison and the development of the first symptoms proving effect. The incubation varies with the different poisons, and certain defined periods of it are, usually, specified. But, in truth, the exceptions are too numerous to admit of the construction of any definite rule. In brief, I may say that the period ranges from one or two hours to twelve or even fourteen days. During the time, be it long or short, the poison increases in the part in which it has been received, and transforms the surrounding fluid that is susceptible to its action into poison like to itself. The poison, if it do not escape outwardly, is carried into the body by the circulation, and excites the symptoms by which the particular disease it induces is characterized. Then there comes a moment when the system reacts against the poison, and a struggle is instituted, if by such a term I may express myself, whether the poison, carried into the organism, shall be disposed of more quickly than it can be reproduced—in which case recovery from its influence is probably ensured,—or whether it shall be reproduced too rapidly to be disposed of,—in which case death from its influence is the common fate. Anyone who has intelligently watched the simple process of vaccination has seen this order of events in the form favourable for recovery. There is first the insertion of the infecting particles; secondly, there is the local action leading to the formation of more of the infecting particles,—lymph, as it is ordinarily designated: thirdly, there is the evidence of disturbance in the system at large: fourthly, there is the complete formation and inclosure of the infecting matter, followed by its drying up into a scale or solid substance: lastly, there is cessation of all the symptoms which indicated the presence of the infection within the body, and recovery.

The period of incubation depends, I believe, upon the extent of secreting surface infected, and upon the natural activity of the secretion which becomes infected. From a large serous surface, such as the peritoneum, or a large mucous surface, such as the alimentary canal, the secretions infected with poisonous matter to which they are susceptible quickly produce and distribute the poisonous organic product. From a limited and open surface, on the other hand, such as the conjunctiva, the poison may not be absorbed at all, and there may be infection without the development of any severe constitutional symptom. The poison is ultimately eliminated in every case by secretion.

2. The diseases belonging to the class we are considering, and springing from the action of an organic poison are, according to my view, all

glandular diseases. Thus, scarlet fever is a disease of the lymphatic glands; measles, of the mucous glands; typhoid, of the closed intestinal glands; cholera, of the mucous glands of the stomach and open intestinal glands; yellow fever, of the liver. I reason that the glandular complication, as it is called, of these diseases is not accidental, but regular; and that from the secretion of the affected glandular structures the reproducing poison is formed.

3. The general or constitutional symptoms which characterise the communicable diseases present many varying phases; but, with one notable exception, they have certain leading symptoms in common. The first indications that the poison has taken effect and is influencing the system at large, are a series of nervous symptoms. These consist of pains, usually in the back and in the head, followed by nausea, or vomiting; next by shivering and coldness, and afterwards by fever. The last-named symptom, the fever, or increase of heat, becomes soon the one symptom that governs all. If it keep within due bounds, the disease runs through its stages with a certain precision of movement, with a certain fairly-defined course, and with comparative safety. But if the temperature during the febrile state passes a given limit, the danger is imminent. So accurately has this danger been measured, that we

know now by the readings of the thermometer the fatal increment of heat. I have determined from observations on man and on various warm-blooded animals, that the increment of heat which proves fatal is from 11° to 12° Fahr. above the natural temperature of the animal. In the human subject a steady elevation of temperature to 100° Fahr. indicates fever; an elevation to 105° indicates danger; above that, great danger. At 109°, eleven degrees above the natural temperature, 98°, the condition is fatal.

4. Under the increase of heat common to the communicable diseases, the pulse rises, the respiration becomes quickened and, if the heat rapidly intensifies before there is equalization from perspiration, the tension of the extreme or minute blood-vessels is increased. The surface of the body is dry as well as hot,there is accumulation of water in the blood, and thereupon succeed a new and distinct series of symptoms, technically called symptoms of exudation. The visceral cavities, and the visceral organs themselves, may thus become charged with exuded fluid. In this manner arise those many complications which mark the course of the acute epidemic fevers.

5. While, under the influence of the fever, the solid organs are becoming affected, the fluid blood is subjected to the most serious disturbance of its constituent parts. Its plastic portion, its fibrine,

may undergo one of two modifications; it may increase by accumulation, and thereupon separate as a semi-solid obstructing mass within the blood-vessels, when it is often a cause of sudden death; or it may be rendered intensely fluid, in which case it fails to maintain the vital functions in their full activity. Again, it may become surcharged with the gases intended to be excreted from the organism, under which condition, what may be correctly termed an asphixia commences in the blood and leads to the cessation of life, by the same process, virtually, as suffocation. In small-pox I have seen death produced in this manner within a few hours.

6. In addition to the primary organic changes of the body, occurring during the course of the communicable diseases, many secondary and local injuries may arise, leading to important after effects. These are all the results of the febrile state, either of the exudation of plastic fluid from the blood, of destruction of tissue by ulceration, of obstruction of the secreting surfaces of glandular organs, or of modification of structure in nervous matter. Thus, small-pox may be followed by pitting of the skin, by deafness, by blindness, and by other lesions incident upon ulcerative change; scarlet-fever by arrested function of the kidney, and dropsy; diphtheria by a local paralysis.

7. Happily, in the large majority of instances of these communicable diseases, the course of the disease is, through certain fairly definable and defined stages, towards and to recovery. This course is, as we have seen, strongly influenced by atmospheric conditions; but in the large majority of instances it prevails.

8. Still more fortunately, amidst the misfortune of the presence of these maladies, is the fact that certain of them occur, as a general rule, but once in a lifetime; in other words, one attack precludes more. The rule is open to many exceptions, but it is maintained with sufficient exactitude to save an incalculable number of lives, and actually in some instances to warrant the production by art of a mild form of a disease in order to prevent the accidental development of a more severe form. I refer to the introduction of cowpox for the prevention of small-pox. The diseases that are least susceptible of recurrence are small-pox, measles, scarlet-fever, hooping-cough.

9. In the majority of instances, recovery from the effects of these communicable diseases is so perfect, that no organic disqualification remains; for, happily, owing to the beneficent discovery of vaccination, the days are passed when small-pox left its millions disfigured of feature, or lame, or deaf, or blind.

A Specific Communicable Disease.

One disease stands apart for notice. The communicable malady called "specific," or syphilis, the moral as well as the physical blot on our civilized life, I must mention forcibly, however unpleasant and brief the utterance. The poison of this malady once engrafted into the living body, and producing its effects there, leaves, according to my experience, organic evils which are never in the whole of a lifetime completely removed. Of the many examples of this form of disease which in thirty years of medical life I have seen, I can recall not one in which some permanent evils have not been inflicted. In many instances the evils have passed in hereditary line; in all they have remained in the organism first affected, tinging, to the end of its life, every other disorder, and producing themselves some disorders which surreptitiously assume independent characters, and are looked upon too often as distinct and independent constitutional or local affections. Various forms of disease of the skin; the disease known as lupus; some forms of consumption; some phases of struma or scrofula; many forms of cachectic feebleness and impaired physical build,—what are denominated delicate states of constitution,—these and other types of disease are so directly and indirectly connected with the specific taint, it becomes impossible to be too careful in tracing it out, or in measuring the degree to which it extends in the field of morbid phenomena. In a word, this communicable disease, though the most controllable, is probably, taking it all in all, the most prolific of injury to human kind. In the happier days to come, when, under moral influences, this malady shall cease, the nosologies of the learned will have to be revised, that they may be curtailed of loathsome phenomena now too truly registered, but then, except by the records of the past, unknown.

I have called the diseases described in this chapter controllable. They are so; but they are not, as is vulgarly supposed, preventible. They are too closely dependent on refined changes in the chemical physics of living bodies to be suppressed altogether. But they may be kept within bounds, and as the mode of action of the poisons which excite them is better understood, they may all become curable. Once great and mortal plagues, they are now reduced to scourges, and may be reduced, ultimately, to stripes. But to be held in check they must be held ever under the observation of the physician and under the dominion of his art.

CHAPTER VII.

PHENOMENA OF DISEASE INCIDENTAL TO OLD AGE AND NATURAL DECAY.

STRICTLY speaking, old age exhibits no active phenomenon of disease peculiar to itself. It presents to us nothing more than a declining resistance to the attractive force of the earth. During its progress the tissues become more condensed; the bones become firmer, the cartilages harder, the articulations closer; the muscles fail in their tension; the organs of the senses lose their refined adaptations, and in the eye the arcus senilis, a white interstitial deposit containing fat, arches the cornea; the skin, falling into wrinkles and folds, loses its colour, softness, and elasticity. Lastly, the nervous centres,—reasoning, emotional, and sensitive,—lessen their activities; they are no longer the readily charged receptacles of the stimulus to the animal motion. Probably their failure is, indeed, the primary cause of all the other failures, for when in the early life the nervous supplies decline, the parts imperfectly supplied grow prematurely old, from the error of nutrition that thereupon succeeds.

But these are hardly to be called phenomena of disease; they belong as naturally to the declining period of life as certain phenomena of development—the cutting and the shedding of the teeth, for instance—belong to infancy and childhood; and, although the end of them is death, it is death according to the ordinance of nature.

The end, when it comes at the duly and fully appointed time, is, I believe, always preceded by failure of the nervous stimulus. The muscles would continue to act if they were excited and directed into action; the secretions would proceed, and, in truth, often do proceed when the faculties of mind and of volition have ceased; but the nervous organism through its varied parts fails, and with it all the parts that depend upon it for animation.

The order of failure of the nervous organism is systematically perfect, and is a wonderful semblance of that temporary death of nervous function which we call sleep. The parts that minister to the senses fail first: next the faculties of memory, reason, and volition. The passions follow. Thus the body is left at last, while yet it lives, yielding truly phenomena of life, but of the mere organic or vegetative life. The respiratory muscles move, the heart moves, the digestive organs move, and the instincts to which these parts minister, feebly and feebler, survive. The instincts die; the digestive power dies; the breathing begins to die. In the close of the scene the heart ceases its beats, ceases not suddenly but in fitful phase of action; a beat or two and a long pause; a faint breath, another series of beats, a pause; and, with diminution of breathing and diminution of series of strokes of the heart, prolongation of the pause until the complete cessation of action.

On the nature of the organic change which prevents the nervous centres from receiving the impressions of the outer world, and which also prevents them from transmitting their impulses to the organs of motion under their command, I have made recently some experimental researches which throw, I hope, a light on a very curious and interesting subject. I have learned that the gradual transformation of the vital organs of the body, from the advance of age, is due to a change in the colloidal matter which forms the organic basis of all the living tissues. In its active state this substance is combined with water, by which its activity and flexibility is maintained in whatever organ it is present—brain, nerve, muscle, eye-ball, cartilage, membrane. In course of time this combination with water is lessened, whereupon the vital tissues become thickened, or, to use the technical term, "pectous." By attraction of cohesion the organic particles are welded more closely together; until, at length, the nervous matter loses its mobility, and the physical inertia is complete.

I have spoken of these changes towards death in the aged as natural phenomena. They are so; but they do not progress in their course without exposing the body to increasing risk from the effects of the many and varied external influences which produce the phenomena of disease. As a man has greater difficulty in his old age than he had in his youth to avoid the grosser physical accidents to which he may be exposed, so has he also greater difficulty to avoid many of those more refined physical accidents of disease which strike, but strike unseen.

He feels every strain to which he is subjected more determinately, and from all physical disability he recovers indifferently. Thus, after such a shock as follows a capital operation of surgery, he sinks so much more readily than the young that a fixed scale of mortality may be constructed on the facts. For example: in respect to one operation, that of lithotomy. The mortality from this operation increases from the proportion of one in seven in the young, until it reaches to one in four in those of the third or declining period of life.

The same rule obtains when the influence of serious causes of disease are at work; and hence the suddenness with which a slight attack of disease prostrates and destroys the aged before they have fully completed their cycle.

At the same time the aged man is less exposed to danger from some diseases than he was in his earlier life. He has passed the ordeal of the epidemics. He has passed through the periods of life in which tubercular consumption is commonly developed, and when he suffers from acute diseases the intensity of their phenomena is reduced.

Fatal Diseases of Old Age.

The conditions of disease which lead to the majority of deaths in the decline of life and which anticipate the purely natural death are, briefly, as follows:—

1. *Failure of the heart.*—There is a mode of death in which the heart, instead of outliving the rest of the organic parts, in the natural way, fails prematurely in its duty. The failure thus indicated is usually in the nervous supply of the heart, and is indicated by what is called intermittent action. The pulse-stroke in such cases ceases once in every few beats; and the pulse, taken at the wrist, is found to intermit. I have never yet met with a person

who has not this intermittent action of the heart after the seventy-fifth year of life, and in the majority of persons it is presented at an earlier period. The heart itself, I mean the muscular structure of it, is not necessarily diseased, and in truth, between disease of the muscular structure and the failure of which I now specially speak, there is no actual relationship of cause and effect. The cause of the failure is irregular nervous stimulation of the heart; the centres of organic nervous force which naturally, if I may use so plain an expression, prick the muscular walls of the heart into contraction, fail at uncertain intervals; the message for contraction is not sent, and thus the momentary pause or break in the order of pulsations takes place.

When the structure of the heart, or of its valvular machinery, is perfect, this hesitation of the heart may remain for many years, and in the end may not be the cause of death. It may continue even to the Euthanasia; but whenever it is present in a marked degree, it is, indirectly, a source of danger. The man or woman with a hesitating heart, whatever the age may be, is thereby unfitted for sudden tasks, demands, resolves, which, when the heart is firm, are considered comparatively as of little moment. For when the heart hesitates, the brain, which reposes for its power on the blood which the heart supplies to it, hesitates also. The same person is also less able to bear bodily fatigue, to lose any of the usual hours of sleep, to miss the accustomed times and quantities of food, to endure extremes of heat and cold, to meet the anxieties and calamities of life, to undergo surgical operations or physical accidents, and to sustain life against acute or chronic disease.

The intermittent action of the heart is thus a source of failure, central in character and persistent in duration, under which, in the aged, on the addition of any new embarrassment, the physical powers of life rapidly succumb. A crash of sound, a fit of grief or of joy, a slight accident or shock, a severe cold, a sudden embarrassment in the circulation of the lungs from a fall of the external temperature, a suppressed secretion and therewith an increase of pressure upon the heart; any of these influences are sufficient to make the temporary a fatal failure.

The mode of death in such instances is, usually, after the manner of a gradual collapse; but it may be from an instant collapse—syncope. By proper care it may be avoided more easily than some other dangerous conditions the existence of which are not so definitely proclaimed.

This phenomenon of disease in the aged,—intermittency of the heart,—is, practically, a warning of danger, and the extent of failure it implies may, in a measure, be accepted as an indication of the value of life, and of the external physical risks from which the body should be protected.

2. *Separation of parts of the blood.*—Another phenomenon of disease presented by the aged, and which I have observed several times, is a separation of the plastic or fibrinous constituent of the blood from the other parts of the blood, and its condensation, in a distinct semi-solid mass within the heart, or within the great blood-vessels. We have now for nearly two centuries past been conversant with this change of the blood in the course of some acute diseases, and it deserves to be recognized as common also in the stage of life of which I am speaking. The ultimate cause of death during the pure natural act of death—the Euthanasia—is this act of separation of the plastic matter of the blood; but sometimes the change takes place prematurely. Occasionally in the aged the separation occurs in the vessels of an extremity, as the foot, and then, from the arrest of the circulation through that extremity there is local death, or what is called senile gangrene. More frequently the separation, as a last act of a living character, takes place in the heart itself, checks the circulation of the blood over the body at large, and leads to dissolution.

I have observed many instances of deaths occurring to the aged from this mode of arrest of the circulation of the blood; and, without entering into minute details, I may note that I have never made an examination of the body of a person who has died from pure old age in which separated and solidified fibrine has not been found within the heart. As a rule, the separation has taken place on the right side, in the right auricle or ventricle, or in both these cavities of the central organ of the circulation. The separation, in such examples, has been slow, and the death prolonged, as if the two processes of dying and of separation of the blood were proceeding side by side, the act of separation making the death absolute. In other and rarer examples, the separation has been conducted slowly, but has been sudden as a cause of death. The fibrine has separated gradually, either in the pulmonary artery on the right, or in the great aorta on the left side of the circulation; and it has been laid down as a hollow cylinder, through which the blood has continued, for some days, to flow. At last, from lessening of the calibre of the cylinder of fibrine, the current of the blood has carried the mass entire, from what may be called its moorings, into the channels of the circulation where they are narrowed, and here, acting as a solid obstacle to the current, it has arrested the flow of blood, and led to instant death.

The tendency to separation of fibrine is often well marked in the prime of life in those who have been reduced from loss of blood, from privation of food, or from excessive physical fatigue. Slowness in the course of the blood, and a break in the balance of the constituent parts of the blood, aid to cause the plastic-colloidal fibrine, always in a state of trembling equilibrium, to pass into the pectous, or thickened state, and so to separate from the fluid blood. In the aged, the conditions of slow circulation, and of modified blood tending to separation, are always present, and life, thereby, is held by so slight a tenure it is often a marvel it endures.

The circumstances leading to death of the aged from this cause are few, and often, apparently, trivial. A slight cold, a sudden mental or physical shock, an attack of acute local inflammation, as of erysipelas, an excess of fatigue, a too prolonged abstinence from food, in short, anything that tends to disturb the equilibrium of the constituent parts of the blood is sufficient to precipitate the plastic matter and to render it a source of fatal obstruction to the circulation.

3. *Vascular congestion.*—Another cause of death in persons who are near to the stage of natural

death is vascular congestion of the vital organs, especially of the lungs or the brain. With the loss of elasticity of limb, there is loss also of elasticity of the blood-vessels of the body. The arteries, which, in youth, yield before the stroke of the heart, then recoil, and by their recoil help to force onward the current of the blood, and actually, by what may be called a backstroke, feed the heart with blood,—these arteries lose their resiliency: at their extreme terminal parts they become rigid, and sometimes are altered in structure from degenerative changes, fatty, atheromatous, or calcareous. In this manner the refined regulation of the passage of blood in the course of the minute circulation through the vital organs is impaired; the blood is imperfectly driven over from the arterial to the venous side, and its partial arrest, or its congestion, as it is commonly said, ensues.

The effect of a sudden fall of temperature is always disastrous to those in the decline of life, owing to the readiness with which, under the influence of cold, the vascular structures become paralysed and their functional activities impaired. Cold robs the body directly of force, and it exerts a physical influence on the blood-vessels, first producing contraction of them, in their minute distribution, and afterwards causing feebleness of tone in them and undue relaxation.

I have already reviewed the extent of the changes in the organic life that is induced by a low wave of heat, and have pointed out the influence of such wave on the healthy life after its thirtieth year. I have also traced the increasing influence of that wave onwards as it progresses in power upon the advancing life, doubling in its potency as each nine years of existence have glided away. To the old man cold comes as a yearly messenger, ready to carry him to his rest; in which course it is aided by many accidents, one of which deserves special attention, because it is very common, and is avoidable.

This accident, which may be called the accident of reaction, is induced by the attempt to restore warmth suddenly to the body after its exposure to a low temperature. It is one of the best-known facts in science that when a part of the outer surface of the body has been exposed long to cold, the greatest risk is run in trying suddenly to re-induce warmth. The vessels become rapidly dilated, their muscular fibres relax, and extreme congestion follows. But what is true of the skin is true equally, and with more practical force, of the lungs. An enfeebled man goes out when the wave of temperature is low and soon feels oppressed, cold, and miserable; the circulation through his lungs has become embarrassed, and he is not oxidizing freely: he returns to a warm place, he rushes to the fire, he breathes eagerly the heated air, and adds, perchance, to the warmth by taking a draught of hot stimulating drink; then he goes to bed and wakes in a few hours with what is called pneumonia, or bronchitis, or both diseases. What has happened? The simple physical fact of reaction under too sudden an exposure to heat, after exposure to cold. The capillaries of the lungs have become engorged and the circulation static, so that there must be reaction of heat,—inflammation,—before recovery can occur. Nearly all bronchial affections are induced in this manner, not always nor necessarily in the acute form, but more frequently by slow degrees, by repetition and repetition of the evil. Common colds are taken in this same way; the exposed mucous surfaces of the nose and throat are subjected to a chill, then they are subjected to heat; then there follow congestion, reaction of heat, pouring out of fluid matter, and the other local phenomena of catarrh.

The wave of low temperature rolling over a given population finds inevitably a certain number of persons of all ages and conditions on whom to exert its power. It specially catches those who are old, and them, too often when they least expect it. An aged man, with a sluggish heart, goes to bed and reclines to sleep in a temperature say of 50° or 55° Fahr. In his sleep, were he quite uninfluenced from without, his heart and his breathing would naturally decline. Gradually, as the night advances, the low wave of heat steals over the sleeper, and the air he was breathing at 50° or 55° F. falls and falls to 40°, or it may be to 35° or 30°. What is less likely to follow than deeper sleep? Is it not natural that the sleep so profound shall stop the labouring heart? The great narcotic never travels without fastening on some victims in this wise, removing them, imperceptibly to themselves, into absolute rest.

The precise mode in which life is terminated, under these circumstances, is varied according to the organ in which the arrest of the circulation commences. That organ in which the vascular derangement is most determinate is commonly and naturally the first to give way, and by its failure to show, symptomatically, the signs of its distress. If the brain be the organ first affected, we define the death, usually, as from apoplexy; if the lungs, we speak of it as from pulmonary congestion, or congestive bronchitis; if the kidney, we record renal congestion, and so on, the name of the disease being, as a rule, assigned to the earliest developed series of the phenomena.

Not unfrequently, after congestion of the lungs, there is partial recovery from the congestion, and death from a secondary cause. The animal temperature of the body being much reduced, the watery vapour that should exhale from the pulmonary circuit in expiration is not freely evaporated. Then there occurs condensation of fluid in the bronchial passages, interference with the course of the air on its way to the blood, and suffocation. The body is drowned in its own exhalation. This mode of death is common amongst those who reach the last stage of life.

4. *Failure of digestive power.*—A last, but perhaps least frequent, mode of termination of life in those of the aged who approach, yet do not realize, the Euthanasia, is by failure of the digestive function.

An entire failure of appetite and in time even a dislike for food, is manifested in these instances, as though the stomach had lost all its powers—sensitive, secreting, digesting, propelling. Under this condition, I have known death to occur by starvation, while still the mental faculties have remained clear until the very hour of dissolution. Happily in such states all the sensibilities which by excitement constitute pain, are in sympathy with the stomach, and suffering of an acute kind is saved. The final stage is one of coma, a final sleep from sheer exhaustion.

In all the modes of death occurring to man during the third stage of his existence, the pain of death and the dread of it is reduced in proportion as the period for the natural termination of life is approached. The very young know only of death by what they accidentally hear of it and, happily, have no more dread of it than of sleep. The adolescent, full of life, think death impossible in them, even when it is closing their eyes. The continually afflicted and wretched learn to feel that death is better than a bitter life. Those who, between the meridian and the decline of life, have peace in their possessions, whose ways are prosperous in all things, and who have felt the dread of death during the transitional stage from prime strength to first weakness, find their fears gradually allayed by a growing sense of lesser care for that which is, and by the development of a mental process of adaptation to the inevitable. The old, passing beyond even this phase, die, by a change of physical state, to themselves imperceptible,—when the harmony of nature is maintained to its designed end.

PART THE SECOND.

PHENOMENA OF DISEASE INDUCED AND SPECIAL.

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CHAPTER I.

DEFINITION AND CLASSIFICATION.

UNDER the term Induced Diseases, I include those phenomena of disease which spring from causes which are entirely under our own control, and which need not exist at all, if the mind were fully trained to resist them.

Some few men by force of character, or by happy circumstances, have so resisted the influences leading to these diseases, that, exempted from them, they have passed to Euthanasia; and, without a doubt, all men who have most resisted them have passed the most securely to the natural death. For induced diseases, when they have become established in an organism, however perfect it may have been originally formed, not only of themselves destroy, but assist in their destructive course the maladies which are incidental and are out of the domain of volition.

The induced diseases spring from several classes of causes. (*a*) Some of them are due to an excess of labour or excitement, to which the body is physically subjected in one or other of its organs or parts. (*b*) Some arise from the action of agents taken into the body, and which change its material structure. (*c*) Others spring from the particular habits and customs of the community. (*d*) Others, again, are referable to the communion of healthy with diseased organisms.

The induced diseases included in the first class of causes are dependent on over-action of some particular system of the organs of the body, and are developed even though the body generally is well nourished and well protected from the incidental forms of disease. The over-action may be of two kinds—mental or physical. It may consist—that is to say—of excessive over-work of the mental organization, or of over-work of the mechanical and merely physical organization. Yet so intimately are the mental and physical organizations combined in their common labour, that mental overstrain leads inevitably to physical disturbance, and is, indeed, first declared to be injurious by the evidence of physical injury : while physical overstrain incapacitates both the corporeal and the mental faculties in direct ratio to the extent to which it is carried out, —from simple fatigue to exhaustion, from exhaustion to collapse, from collapse to death.

The diseases of the second class, those induced by agents taken into the body, are an extensive group. They are due to a degeneration of organic structure arising from an interference with the natural nutritive and chemical processes essential to the continuance of the healthy life of each individual part, and of all the parts in combination. The agencies acting to produce these diseases are, as a rule, luxuries; and if, by strict argument of science, we call that a luxury which is really not necessary, but is simply enjoyable, there is no exception to the rule. The agents specially included under this head are alcohol, tobacco, narcotics and certain extreme artificialities of food.

The diseases of the third class, namely, those induced by particular habits incident to special developments of civilization, are caused either by the disregard of certain necessities of healthy existence, or by the introduction of some positively mischievous processes, by which the construction of the body is perverted. Irregularities of living, irregular or insufficient periods of sleep, errors in clothing, and mechanical restraints on the movements of the body by articles of attire, are included under this head.

The diseases of the fourth class, arising from the communion of healthy with diseased organisms, constitute one of the largest classes of the induced order. Their causes work with infinite subtlety through the passions, and through those instinctive impulses which in natures but ordinarily endowed with the higher reasoning elements are well-nigh irresistible. This fountain of induced disease flows on more than any other in hereditary current. Communion through marriage is a constant tributary to it and, wherever life springs from a communion, one or both elements of which are imperfect, the result is necessarily towards some manifestation, slight or severe, of this diseased action. So refined, indeed, are these causes, that mere imitations, from companionship, are apt to induce realities of disease.

In addition to the four classes of disease thus specified and which spring from causes under the influence of the will, I may add another class induced by certain occupations which are inimical to health and life. To some extent the law of necessity prevails here. The occupation is demanded, and the pursuit of it enforces exposure to injurious influences. To a certain extent, therefore, these diseases are incidental. They are, at the same time, largely controllable, and, in this sense, they come legitimately into our present studies.

CHAPTER II.

DISEASE FROM WORRY AND MENTAL STRAIN.

In this chapter we have to consider a series of diseased conditions orginating in excessive nervous activity; phenomena of disease arising from excessive mental strain, or from mental shock. We find these phenomena mainly in four classes of our community: (1) in persons engaged in art, science, or literature: (2) in those who are engaged in political life: (3) in those who are occupied in commerce, exchange, and speculation: (4) in the too laborious scholars or students.

Whatever may be the position of the man, the phenomena indicating that he is being subjected to mental strain exhibit a remarkable similarity of character. The diseases induced are limited in number, and, physiologically, hang closely together—links, as it were, of one chain. They all depend primarily upon a deficiency of power or paralysis of the organic nervous system, of that part of the nervous organism which sustains the motion of the heart, the stomach, and digestive system, which governs the secretions, and which, in a word, ministers to the involuntary and instinctive, as distinguished from the voluntary and intellectual life.

Broken Heart from Mental Strain.

The diseases from mental strain or shock, which first deserve our attention, are those affecting the heart,—diseases due to failure of the nervous supply of the heart, and induced by excessive nervous activity. In common language, we may apply to these diseases a common term which has long been familiarly used, "broken heart." The reader is not, however, bound to accept under this term an actual rupture or bursting of the heart. This extreme accident may, indeed, happen and cause immediate death, as in the case of Philip V. of Spain, who died, according to Zimmermann, on hearing of the defeat of his army; but it is, practically, of rare occurrence. Most commonly the heart is rather to be considered as broken in power, by reason of the disorganization of structure or action, than as ruptured simply in one part: and death may be considered as due rather to the gradual wearing out of a motion that is essential to life, than to the sudden destruction of the motive organ, from positive break.

If one who knows even nothing of anatomy or physiology will think for a moment on the position which his own heart holds to his economy at large, he will readily detect, nay will feel that no organ in the body is so liable to wear and over-wear, as the heart. He will think of its incessant activity; that when every other part of the body sleeps, it keeps on its perpetual movement and propulsion. That whenever an increased effort or action is demanded, the heart is called upon to supply more force. The healthiest man knows these things: he runs, and his heart audibly beats; he romps with his children, and it is the same; he laughs, and his pulses rise higher, for he feels them throb: he enjoys the table, and, again, he is conscious that his pulses are rapid and his heart at full swing; and when any one of these "excitements," as they are called, is over, he is conscious of a corresponding depression which is felt to be central: a physical depression in the chest, as though a vacuum were within, and air were pressing from without. Some call this sensation "sinking," others call it "emptiness"—it is both. The overworked, engorged heart has relieved itself of its great burden, and by partial repose is becoming restored to power. But when the heart reposes, all reposes: the stomach, which requires from it a large supply of blood, is enfeebled: the brain, also waiting for blood, is inactive:

every part, in fact, waits for the organ in the centre of the body, upon which the whole body rests, as upon an inverted cone.

All hearts, moreover, are not built equally strong to bear fatigue. We say of some men they are "lion-hearted;" of others, they are "faint-hearted." How true are these definitions! Physical courage depends on strength of heart, and men vary, from their babyhood, in their courage according to such strength. We enter a school and find invariably two classes of boys; cowards, so called, who never fight, and valiants, who are ready to fight to the death. Let us examine these classes, and we shall at once discover a cause for the difference. The nervous boys have weak, the valiant boys strong, hearts. The first may become, in time, by far the most powerful, morally, and the most reflective; but the latter are the men who supply the chivalry and industry of the world.

Again, the healthiest men will remember, however serene their course may have been through life, with what eager haste the heart responds to thought and emotion. I believe that not a single external impression can be made on the senses that is not conveyed to the heart, and registered upon it. When the mind is subjected to sudden fear why is the brain bereft of power, and why do the muscles languish and the skin pale?

It is the sudden force communicated to the heart, stunning it as from a blow. Does overwhelming sorrow suddenly come :—is it not the heart which gives way first, so that the strongest and sternest men make instant diagnosis, and proclaim the fact as skilfully as the physician? Cromwell hears his son is dead, and "It went clean to my heart, that did," is his description of his experience. Does revenge or anger inspire a man to fiery determination: whence the spring? Hamlet, in the fury of his revenge, tells us: "Hold, hold, my heart." Does increasing gloom fall on the mind :—why, in every action of the body, does it show itself—why do the limbs tremble, why is the head bowed down, why does the body stoop; why do the muscles grow feeble, and the face careworn? Why does the skin become shrivelled, the hair dry and crisp and grey? Why does the memory falter, and the hand follow it? Because the heart, in every such condition, is failing in its power.

Notwithstanding these facts, the heart can bear and suffer longer than other organs, which have much less work thrown upon them, and can be subjected to impulses and influences in a way altogether peculiar and extreme.

In perfectly natural states of existence—when good food and good air supply perfect blood for building up the tissues—the heart will continue, to an advanced period, to support an action considerably beyond the bare range of its functions. But in those who live a life that is altogether artificial, and in violent opposition to nature,—who sacrifice their powers to overwork of mind as well as body, and who neither in sleeping nor waking give a respite to the labouring heart,—in those the organ undergoes a disorganization which is equivalent to its rupture.

Subjects of Failure of the Heart.

The persons referred to are generally of sound constitution at first, and, in fact, become what they are from the very power which they have inherently possessed, and which has led them to believe that they are capable of doing and enduring anything. They are wont to make a boast of their constitutional wealth, and to draw on their bank of life as purse-proud men draw on their bank of money; as much as to say, "See what I can do, endure, and accomplish!" In the heyday of their career, while the vital bank is good, and while they are taking out of it what can never be replaced; while, in fact, they are subtracting from the end of their lives that degree of action and of power which they are adding to their youth, they, and too often their admiring friends also, exult in their achievements. They are held up as examples of industry to the less impetuous, less laborious, or slothful, and as models for younger men of ambitious mind.

In whatever position these persons are found, they exhibit as a rule the same unnatural picture, during the period of their active career. The basis of their proceedings is this,—that they have a certain object which must be pursued and accomplished while they are young, and which when really accomplished will enable them to rest upon it after the middle period of life, or earlier, if that be possible. Acting on a belief which is the fruit of a vicious training, they conjecture that after middle age nothing can be effected; that a man who does not succeed before forty will not succeed at all; while, if he succeed in the prompt manner desired, he will have attained the height of human felicity. Then he may retire; may go, if he please, with his withered heart and brains, to manage the nation in the Commons, may sit, in high place, on committees of charities, or rule amongst the great unpaid.

Of course the whole argument is an unmitigated delusion and falsehood:—an actual possession of an evil spirit, guiding well-nigh inevitably to two ends—disappointment and death. In the majority of instances the effort fails; and in cases where it succeeds the expectation of results is commonly barren. Retirement, as a source of happiness, turns out to be a delusion, and a condition of body is established, the misery of which is too often relieved by nothing less potent than the inertia of death.

Symptoms of Failure of the Heart.

Presuming always that no acute disease intervenes to hasten on the end of the victim of mental strain, the first symptom, which indicates that he is carrying his work too far and that his heart is beginning to suffer, is an unusual restlessness, coupled with an extreme sensibility, irritability, and perhaps, paradoxical as it may seem, an overweening desire to do more and yet more work. He forswears amusements, not necessarily because he thinks them wrong, but because they interfere with his pursuits, and in a little time he forms a theory that others about him, whether young or old, should forswear them too. The mere play and prattle of children are to him a penance. At first, he was depressed by failure and elated by success. Presently, success and failure act upon him as one and the same thing. He boasts that he has sacrificed the poetry of his life and become a cool business man; and yet he yearns for something which he cannot now define, since success has lost its charm. Next, in sleep, he dreams of the business of the day, and speculates in his dreams until at last he is awakened by an inward strife. Occasionally his dreams take a particular form, and are specially annoying. Thus, one gentleman who consulted me, and whose end was very deplorable, was haunted for months with a dream, to the effect that he was continually buying magnificent furniture, which, on being put to the proof, turned out to be so much rubbish. Gold frames proved to be tinsel, and luxurious ottomans were covered with rags and stuffed with sawdust. I notice this dreaming phenomenon as of peculiar import. Whenever a man who is actively engaged dreams regularly of his work, whatever it may be, he receives a first warning that he is doing too much, and that the excitement of his day is being perpetuated into the night.

A little further on sleep begins to fail, and the night is passed, during its early part, in feverish restlessness, ending in desire for prolonged repose in the morning, which desire can of course never be allowed to have its way. And now, this stage reached, direct physical derangements succeed, which proclaim that organic mischief, long latent, is at last a developed fact.

Sleepless nights are followed by an inability to receive or digest a proper amount of food; and meals, which have probably been taken at irregular intervals and in haste, become objectionable. The appetite is capricious, and so soon as a meal propelling stroke. The physician, feeling the pulse of a patient of this kind, detects that the pulse intermits; or listening to the heart for its sounds he misses at intervals a stroke. The music rendered to his ear by the healthy heart runs thus—as one may say it almost with the lips—lūb, dûp, followed by a pause; but now, instead of the sounds being continuous, they are interrupted by this change—lūb, dûp, dûp; two short strokes when there ought only to be one, and no pause. It is the heart-beat of an old man.

In by far the greater number of persons in whom this peculiarity is present, the heart has either undergone organic change of structure, or the regulating influence exerted upon it by the nervous system is imperfect. A heart in the condition named is, practically, broken; in other words, it is out of repair; it may go on for many years if it be not unduly oppressed; but it is its tendency, under any oppression, to become more dangerously enfeebled.

If an attempt be made by the sufferer in whom the disorganization of the heart has progressed to the stage indicated, still to pursue his suicidal course of life, all the symptoms of disturbed circulation increase. The secretions also become irregular. One day the secretions from the bowels are alarmingly free, another day a purgative is required; one day the secretion from the kidney is copious and like pure water, the next it is scanty and loaded with pale pinkish deposit. The end, in extreme examples, takes place most commonly in one of four ways :—

1. The irregular action of the circulation is attended with that severe spasm of the chest, which was called by the old writers "angina pectoris," and which I have since named, on physiological grounds, "cardiac apnœa." In such cases there is a frequently recurring sensation of sinking and exhaustion over the region of the heart. This sensation comes on upon very slight exciting causes, such as deprivation of food for a little longer time than usual, worry, extra fatigue, or excitement of passion. A determinate act of the mind to bear up against this sensation will sometimes temporarily remove it; a glass of wine or brandy taken with warm water will relieve it; a moderate meal will do the same; or lying down at full length. In some patients the sensation occurs at particular times of the day. It is most common between the hours of noon and two or three in the afternoon; it is also common at the time of going to bed. Frequently, perhaps always, it is accompanied by flatulency, and is relieved by dispersion of that symptom.

These paroxysms may go on even for years, without creating great alarm: at last they are intensified. During their presence, the patient grows sick, pale, and cold, and has sometimes sharp pain in the stomach and bowels. The sufferer himself describes, at this stage, that he feels as if his chest were in a vice, compressed and fixed. There is darting pain through the chest—cramp; the limbs and bowels often are cramped; and one or other limb, especially the left arm, is extremely painful. But the great symptom is the terrible dart of pain from the breast-bone through the chest to a point a little above the middle of the back. Under this pain the face is stormed with anguish, and a restless movement is exhibited, as if to dare to breathe were to kill, and not to breathe were to die. At last, in one of these paroxysms, dissolution actually occurs. I have known three broken-hearted men who have suffered this death.

2. In the above-named form of disease there is invariably more or less of melancholy and irritability of mind: but there is a second form of organic nervous failure in which melancholy is the leading characteristic. In these examples the brain is the organ which feels most intimately the deprivation of blood. The spasmodic attacks referred to under the previous head are often present in a modified degree, and the sensation of faintness and of internal exhaustion is often felt. But that which mostly afflicts the sufferer is his settled gloom, or

melancholy. To him life has no charm, and no reality but that which is void and terrible. He may have a horror of death, but he has a still greater horror of life; and it is the result too often, that, actuated by this impression, he determines to take his own life, convinced, in spite of his remaining reason, that there can be no worse torment than that which he endures. In one of our large Asylums I was shown a man some time since, about whom I had a few years before been consulted. At my first interview with him he told me he had borne great anxiety, and had been obliged to work "like a dray-horse." At that time no organ of his body was disorganized except his heart; but that was so unsteady in its action, and so feeble, it was a wonder to me how he lived. He had little pain, but was moody, fretful, and uncertain. One day soon after this interview he tried suicide, was stopped in the act, and placed under restraint: he has remained so for years, a suicidal maniac, ready at any moment, should the opportunity offer, to renew the attempt and rid himself of an existence which has become insupportable.

I could multiply these examples largely, and I must refer to one other, because it illustrates the subject before us in a different light. A gentleman forty-five years of age, who by unremitting attention and night and day labour had amassed a large fortune in a few years, "retired." He had been failing in strength before his retirement, and used the fact as a reason for giving up his work. "Why should he work when he had got all, and more than he wanted, and with no one but himself to care for?" So he sold up everything, and bought a new house out of town, and began to live as a gentleman at ease. A week exhibited to him the delusion he had fostered. He became ill, fretful, feverish, and depressed, until at length existence became a burthen. He had known me a little, and came to ask what he should do. He was a man as goodly to look upon as anyone might wish to see, but with a heart that was virtually worthless. I heard his story, and I knew, as well as if he had told me, the resolve in his mind. But in all his gloom he was cautious, and gave me no such sign as should allow the merest suggestion of truly correct treatment, viz., mild restraint and constant supervision. I recommended, therefore, what was best under the circumstances—a cheerful companion and travel; and the advice was not only accepted, but actually acted upon in part, for he made every arrangement to move in pursuit of a happier life. But one morning his worst resolve suddenly conquered him, and in a moment of extreme despondency he destroyed his own life.

3. In a third form of disease from organic

nervous failure, death takes place suddenly from positive tearing of the heart under great exertion. I knew an instance in which a man in active life, but with a worn-out heart, was hurrying to catch a public vehicle: he had nearly reached it when he fell and died. In this case the left ventricle of the heart was partially ruptured. Death while running to reach a train, or during violent passion or extreme emotion, is sometimes produced in a similar way: the heart, either ruptured or paralysed, ceases its action.

4. Men who have nervous failure or disorganized structure of the heart, die very readily from trifling causes acting upon them from without. A common cold means in them congestion of the lungs. An accident such as a broken bone or a bruise is followed by prolonged shock. Fever causes depression from which the chances of rallying are greatly reduced, and the same applies to the effects of other diseases.

In the narrative through which the reader has been carried I have dwelt on the pure form of broken or disorganized heart, produced by overwork. I shall have occasion to show, as I proceed, that the evil effects of such overwork are often intensified by other influences little less potent,—especially by the excessive use of alcohol, by inattention to diet, by working and sleeping in bad air, and by animal excesses.

Failure of Brain and of Mental Power. Dementia.

The phenomena of disease included under the term "failure of brain and mental power," or dementia, call for consideration as phenomena having often for their cause excessive mental strain. It would be wrong to suggest this as the only cause of dementia, because the term embraces in its meaning an extensive series of symptoms which might perhaps with advantage be divided into distinct groups. Thus there is the dementia of old age; the dementia following upon acute diseases of the brain; the dementia dependent upon extreme physical exhaustion, and so on. This dementia, therefore, of which I now specially speak, though allied to other forms, may be considered as in itself sufficiently distinctive to justify a separate description. It sometimes accompanies that nervous failure of the heart of which I have spoken. More frequently, it stands alone, indicating primary organic changes of nutrition in the brain itself, or at least deficiency in the vascular supply and nutrition of the brain. In its early stages, there is, I believe, judging from the circumstances of recovery I have witnessed, nothing more than an increased tension of the minute vessels which supply the brain. In later stages the substance of the nervous tissue itself undergoes modification by which its activity is permanently lost.

The dementia of overwork connects itself most closely with those forms of labour which, attended with care and anxiety, lead to what is called worry. The mere exercise of the mental powers is in itself, even when it is gently pressed, a healthy exercise. It becomes an evil only when it is accompanied by deficiency of rest, by too absorbing singleness of thought on one topic, by too furious an enthusiasm, by an unnatural fostering of speculative pursuits,—whether in science, letters, or commerce,—or when the surroundings of the man are such as worry and distract, while his labour enforces persistent urgency.

The signs which indicate the advance of dementia from such overwork are alike in all men, however different their spheres of action may be. The first sign is a self-consciousness of want of full vigour, not only of mind, but of body. This symptom, as a common rule, is altogether disregarded, or is felt to be a contemptible but troublesome fact which it were folly even to recognize. It is succeeded by restlessness of mind, and more than ordinary craving for work, with disturbed sleep, and, by no means rarely, with involuntary movements of the muscles of the body at the time of lying down, and during efforts to seek repose. With these symptoms are blended a peculiar and acute sensitiveness to external impressions and influences, and even the idea of influences which are not directly visible. Lines, figures, colours, ocular spectra of various kinds, and new to the senses, start up in the field of vision; sounds, ringing or dull, booming, or sharp and startling, or harsh and grating, molest the ear; while ordinary sights and sounds are disturbed, the agreeable overrated, the disagreeable condemned without reason or measure.

In the order of events, in a progressive case, these signs of overwork are confined, it may be for months or years, to the knowledge of the man himself. Friends see in him merely a man overwhelmed with anxieties, and, as they commonly say, "too anxious," and therefore too hasty. The man himself recognizes the excitability of his life at first with some dread; but he soon becomes familiarized with his condition, and with the objective evidence of phenomena which, according to common experience, ought not to be present. He even accepts abnormal creations as natural, becomes accustomed to them, and may find in them the subject of an easy and vacant contemplation. I knew an instance of this kind, in which a man, deeply absorbed and worried by affairs of the commercial world, during the late American war, retained for weeks in his vision the spectra of three lights from a lustre. The spectra were oval in shape, about the size of a common egg, and very clearly defined as at a distance from the observer of three or four yards. They became so familiar to him that he gave them names, and would sometimes, half consciously, watch them, as they floated before him on the ceiling, the wall, or in space, with such intensity that he would start from them at last, as if waking from a dream.

This stage on the high road to dementia has existed as a physical condition ever since thinking man brought brain matter into excessive demand in one particular direction, or on one particular theme. The hypothesis of ghostly manifestations finds its origin here; the hypothesis of ecstatic vision finds its origin here; the so-called poetic "frenzy" is brain at the point of becoming disorganized in this stage towards dementia.

It is worthy of remark, indeed it is necessary to remark, that all the apparently invisible and impossible things seen and heard under these circumstances are, after all, as purely physical as the most common things of life. They belong to one of three classes of physical phenomena. In some instances they are actual perceptions of real objects or facts caught by an extremely susceptible and delicate nervous surface. In other cases they are a recognition of vibrations or movements occurring within the body, and intensified by the extreme susceptibility of the nervous expanse. But in the vast majority of instances they are actual impressions made at some time on the organism, and now recalled and rendered more definite by constant recurrence.

As already stated, the stage towards dementia, thus defined, is often reached by the sufferer without its being observed by those near him. And yet there would be found sufficient evidences of it, if they were noticed. The man is restless, peculiarly impressionable to sounds or other external annoyances, and "absent." I have known this phenomenon of absence of mind in its extremest form treated as a subject-matter of joke by loving but ignorant friends. This is wrong: whenever a person, previously acute, considerate of the wants of others, and naturally perceptive, becomes lost in himself, or "absent" to a marked degree, it is time that he were considered as diverging quickly from his healthy life, and soon beyond recall.

Presuming that in this stage the mental powers be allowed to have rest, and the fountains of care be closed, there is no reason why there should not be good recovery. But if the overwork be permitted to continue, then, in time, a further and far more alarming series of phenomena are presented. With continued unrest sleeplessness connects itself; and as, when awake, the mind can bear rest for no moment, there is a morbid craving for work, more work—which craving is saddened, I had almost said maddened, by the sensation and appreciation that the physical powers of the body, at large, are failing; that the lower limbs are too conscious of the weight placed on them; that the hand refuses to do the bidding of the will; and last, but most telling of all, that there are lapses and breaks in the memory, or even, as it were, clips out of the very existence itself.

In this stage the man of letters finds himself constructing sentences which are not intelligible to his mind, but which may be singularly good when read by others: or he leaves out words from sentences, or, as is very common, he misspells or spells with doubt, being, in regard to the commonest word, uncertain whether it ought to have such and such single letters, or double letters. Fearing default of memory, he thinks it essential to commit every passing thought instantly to paper. At night, while trying to sleep, he wakes up suddenly, believing that he is dying, or even that he is dead: his dreams become apparitional, and a sudden impulse to escape from some imaginary evil leads him into actual danger of self-destruction. Above all, he becomes morbidly sensitive to criticism, doubts his own powers if they be the least disparaged, or assumes that what he has done is, either necessarily or intentionally, misunderstood.

In this stage the man of business and commerce forgets important details. He misses engagements, or meets them before the time named; he leaves his counting-house unlocked, and his books open, or commits other unusual blunders. When he comes to figures he finds in his mere castings-up errors upon errors. He is a baffled man, and so irritable that his clerks shrink from him. He essays to go away for change of air or scene, but, coming quickly to the conclusion that all must go wrong if he is from the helm, he returns suddenly. He distrusts everybody, he distrusts himself. I have known on two occasions men in this state retire from business as by a sudden impulse, and then, met by the misery of absolute rest, retire altogether from life, by suicide.

In this stage the gambler and the unprincipled speculator show their cards, and, after having defeated the justice of the world for a long season, fall, in their present powerlessness, into desperation, and yield an easy prey to the supremacy of unerring right. In this stage the man troubled with remorse, struggles in vain for relief, confesses his offence, or buries his terrors in a voluntary grave.

In this stage the poet and the novelist become over-sentimental and morbid. Their plots thicken into obscurity, or thin into transparency, and the world says, alas! they have written themselves out.

This stage of disease, in every phase the result of overwork of brain, good work or bad has existed in every known passage of human history. It accounts on the simplest physical principles for some of the most striking features of biography. It indicates a state of disorganization of the brain, in which, one section of the organ worn out, the balance is broken, and anarchy succeeds to what once was order. In every brain, in fact, there is set up, primitively, a kingly force, to which all other forces bend. The king may be good or bad, he may be an hereditary king, or a usurper; but he holds the balance: kill the king, and, in ninety-nine cases out of the hundred, the kingdom is made chaos and dark night.

From the stage here recorded towards dementia, the transition downwards is most easy, and, in many instances, only too rapid. Temporary recoveries are not rare, but I fear I must say that the commonest course is towards further evil. One man becomes an epileptic, another falls into paralysis; a third suffers from special nervous failure in some vital organ, and dies from local disease, of the lung, the liver, or the kidney. A fourth developes some hereditary malady, such as cancer. The majority, escaping these special evils, fall prematurely old and grey, and, looking to friends for support, sink helplessly into death.

CHAPTER III.

DISEASE FROM WORRY AND MENTAL STRAIN—*continued.*

THERE are yet some phenomena of disease induced by worry and mental strain which are sufficiently special in character to deserve a chapter. I refer to paralytic seizure without dementia, to diabetes, and to hysteria.

The paralytic seizure is, in rare instances, sudden in its development. In the midst of what seems to be fair health, the eyelid drops, the tongue is drawn aside, the lip fails, or the hand or leg is stricken powerless. But the rule is fairly strict that there shall be warnings of these events, which warnings, when they are noticed correctly, are often sufficiently decisive. The most characteristic of these warnings is a sensation on the part of the patient, of necessity during any effort, for frequent rest and sleep. When these warnings occur, at however early a stage, a trifling shock may tell on the nervous structures, and transform suddenly the threaten-ing malady into the extreme reality—that is to say, into muscular paralysis. This, in most cases, is at first a local paralysis; but it may at once become general in respect to all the muscular system which is under the control of the centres of volition.

My experience of paralysis from mental overwork is, that when it is merely local, it is often temporary in its duration. If it happen before the actual period of decline of life, it passes away under the influence of rest, and good health is restored. I have in my mind at this moment a striking recollection of this nature, in which a gentleman, forty years of age, in the midst of the labours of an overwhelming business, which was just beginning to prosper, became seized with constant drowsiness, followed suddenly by complete failure of muscular power in the left arm and hand. He had sufficient resolution to take the advice offered him, and to retire at once, for a season, from every business care. In a few months his recovery was complete; and though he has returned to his occupation, and for thirteen years past has continued at it, he has remained, under his own judicious self-control from overwork, in complete health.

Such a result as this is good beyond what is common, but only for this one reason, viz. that the progressing evil was brought rapidly under control. A few weeks of neglect or of perseverance in work would have rendered the injury irremediable.

If the failure be more extended, if it be general in its development, it is often more insidious and less alarming than when it appears as a local paralysis: it may, however, be much more serious. Almost imperceptibly, it may make its way, until at last the reasoning mind and the volitional muscular organism may fail together, leaving a mere instinctive and vegetative body to represent life.

Connected with these paralytic conditions induced by mental overstrain, there is another allied state belonging to men who may be eminently successful in their careers, but who have worked for their success with intense industry and determination. The symptoms in these persons, indicative of the danger I would describe, are those of captiousness, irritability, of increasing dread of failure in spite of success, and of terrible recurrence of anxieties which in earlier life were natural and real, but are at this stage devoid of all reality. Men in the state thus described, will, perchance, work harder than ever, and will continue to earn and amass wealth unceasingly under an impression, the falsity of which they themselves know but cannot correct, that the labour and its reward is absolutely necessary, not for their continued prosperity, but for their absolute necessity. This phenomenon of disease is peculiar to men (I have never known an instance of it in a woman), and is most peculiar to men who have risen into wealth by a long and desperate struggle with poverty. The early impression engendered in these persons, that nothing but work will win, the early experience that this impression may be wrong, the recall to the effort and the repeated defeat,—these influences so act on the mind that at length realized success affords no proof of victory. Poverty must not be vanquished merely; it must, at all risks, be pursued and still pursued as if it were potent for ever.

A persistent muscular and mental restlessness marks out this stage of disease—a stage formidable to an extreme degree. To the restlessness are added other signs, subjective and objective. The man himself is conscious of frequent brief failures of physical power—failures so brief they can hardly be measured by time, but so definite they might have lasted a day or a month and not have been more determinately recognized. Sometimes the vision is for a moment distorted, owing to irregular nervous stimulation of the muscles of the eyeball, at other times there is momentary loss of hearing, or sense of perverted sound. Again there is a feeling that for an instant a knowledge of existence has ceased altogether. At another time during this condition there is actual failure of muscular power, of the briefest duration, in the lip, in the eyelid, in the hand, or in the foot; or there may be a short spasm or revulsion in the chest, and a frequent sudden sensation of intense exhaustion, amounting to faintness, but not extending to deliquium. To the subjective signs are added the objective of restlessness of movement, unnecessary anxiety, irregular sleep, frequent startings during sleep, and quick irritability. Upon these come symptoms of a local pseudo-inflammatory or painful kind, called by different men by different names—"gouty," "rheumatic," "neuralgic" symptoms; and then succeed more serious attacks, as of threatened insensibility. At last the crisis arrives. The man is, as it were, felled by a blow. He sinks suddenly to the earth; he breathes and lives unconsciously; his temperature rises as the resistance to action in the higher cerebral centres increases; there is effusion of serum or of blood upon the substance of the brain, and the disease of being smitten by a stroke, the apoplexy of the ancients, is the recorded cause of dissolution. The attack is struck often by slight causes. Excitement from anger, or depression from disappointment and nervous fear, are active agents in inducing this fatal catastrophe. Apprehension of danger, nay, even the reading of dangers to which others are exposed, or of the sudden demise of others, may be sufficient to produce the peril.

Diabetes.

In those who are subjected to excessive mental strain and worry, or to mental shock, there is always present some variation from the natural state of the secretion from the kidney. At one time this secretion is copious and pale in colour, at another time it is loaded with amorphous lithates, which separate and sink in the form of a pale, pinkish powder, or, it is coated with a thin, fatty-like film. Again the secretion is scanty and of high colour; and still again it is scanty and irritating, so that it has to be passed at frequent intervals, and yet in small quantities. These conditions of the renal fluid, whichever they may be, indicate disturbed nervous function, and ought never to be allowed to progress for long periods of time without attention. As signs of disease, they may not be serious; they may point to nothing more than functional nervous disturbance, and of themselves they may be considered of secondary moment; but still they deserve to be remembered as unnatural signs, and, in connection with other symptoms already described, they rise into importance.

I do not dwell, however, on these variations of the renal secretion as vital. My object is to touch on another condition of the fluid secreted by the kidney in which that fluid is charged with glucose, grape sugar, and by which fact is indicated the presence of the wasting and fatal disease, Diabetes.

Originally diabetes was considered to be a disease due to some organic change in the kidney itself. Then it was marked as a blood disease; in later time it was assumed to depend on an affection of the liver; later still, and latest, it has been all but proved to originate, primarily, from injury to the nervous centres. It has been induced in the lower animals by a minute mechanical injury, the prick merely of a needle, in the region of the fourth ventricle of the brain.

The experimental fact that diabetes can be induced by nervous injury has been supported by observation of certain forms of the disease occurring in the human subject. Let me in proof offer two or three brief illustrations of this fact.

A healthy boy eleven years of age was sent by his father, a carpenter by trade, to a wood-yard to give an order for some timber. In the yard there was chained up a huge and savage dog. The child, not aware of this, passed down the yard, and before seeing danger was suddenly set on by the furious animal. He got out of reach of the chained brute, but was so paralysed by fear he could not for some seconds stir away: he now became faint, was carried home in a state of extreme prostration, and from that hour was stricken of diabetes, from which malady, in three months, he died.

In the above example the mental shock came upon the body like a sudden physical blow. The effect was immediate upon the cause. There are usually, however, some distinctive premonitory signs which lead to a suspicion of danger, which becomes confirmed on the addition of some fresh and severe disturbing influence of a mental character. In this manner I once knew diabetes to occur in a patient who, while undergoing extreme mental labour from teaching, and suffering, at the same time, an unusual depression of mind from physical exhaustion, was startled, at breakfast, by an unexpected outburst of furious passion in the master of the house where she resided. The sufferer, terrified and faint, left the table, and from that time began to show the first symptoms of the disease. A partial recovery has happily taken place in this subject of the malady.

There is yet another cause of this same disease, in which the symptoms are induced, during exhaustion from mental overwork, by additional strain without violent shock. A late well-known statesman, who succumbed from diabetes, explained to me with perfect clearness of detail that he had suffered long before the outbreak of his fatal illness from excessive mental toil. He had known for many years no holiday. He rose to fame by rising early to work, and afterwards, by sitting up late at night also, he managed to hold his supposed treasure. At last, as the result of his own acquired reputation, that reputation itself was staked on a momentous national responsibility. While speaking in the great assembly of the nation he felt faint, and was soon afterwards obliged to retire. He recovered the immediate effects of this effort, but from that moment was stricken with the malady of which, after a few months, he died.

The first phenomena of this disease, themselves few and simple, cannot in this day of overwork and over-anxiety be too well known. They are phenomena of extreme exhaustion of the body, as if "a fillip" were constantly being demanded; of restlessness; of dyspepsia, of occasional outbreaks of febrile heat; of thirst; of dryness of skin; of a constant diuresis which interferes with sleep at night, and of wasting of the tissues. I particularize the phenomena so far, because they are often in the early stages of their development, and when they admit of successful treatment, overlooked. After a time new organic changes of vital organs are set up, and the condition of the sufferer passes beyond the skill and even the hope of the physician.

Phenomena of reduced Vascular Tension. Hysterical Disease.

A class of phenomena of disease due to a reduced arterial tension deserve a short notice. That perfect action of life,—perfect secretion, perfect excretion, perfect nutrition, perfect motion, perfect volition,—should proceed in the living organism, it is essential that the course of the blood, in the minute vessels of the arterial system, and indeed in all parts of the arterial system, should be under systematic physical control. The blood, passing through its infinitely minute and ultimate channels, must pass slowly enough to wait on nutrition, quickly enough to enable the new supplies to pass onward from the heart. To ensure this regular movement, the blood-vessels themselves are placed under a distinct nervous supply and control, under the control of what is called by anatomists the organic nervous system. This nervous mechanism, of which an outline is sketched on the accompanying diagram, lies away from the nervous centres of volition, the brain and spinal cord, and has its own centres or ganglia, which are planted in the line of the great visceral organs,—the head, the neck, the heart, the stomach, the kidneys, and the pelvic parts. From these centres or ganglia proceed filaments of nerves which accompany the blood-vessels, and which govern the tension of the vessels and of the heart itself. If the nervous force of these centres be exalted, the vessels under their control contract, and the course of the blood through them is diminished; if the nervous force of these centres be reduced, the vessels are relaxed, and unless the tension of the heart fail also at the same time, they become filled so unduly with blood that the parts they supply will be seen, if they be visible,—in the cheek for example,—to be flushed, from the excess of blood they receive. The arterial tension is governed from these centres of the organic nervous life as the prime force of a timepiece is governed by the pendulum. The main force of life while it is permitted to go on is prevented running down, and this by a process which stands independently of the will, and is therefore safe from the interference or the neglect of the volitional direction.

But more remains to be told. The organic nervous centres are the centres also of those mental acts which are not volitional, but are instinctive, impulsive, or, as they are most commonly called, emotional,—the centres of that primitive nature within us which we know to be distinct from the more flexible governable nature which is commonly called the reasoning nature, and which is seated in the brain and in its subsidiary parts.

We are all conscious of these two natures. We laugh, or cry, or move instinctively, at something that affects or influences our organic system, and we control ourselves by an act of reason, or in other words an act of brain, and we say the thing was worth laughing at, or crying at, or moving for, or that it was not worth it, as we say of a commodity we have bought, it was, or it was not worth what we gave for it. Thus, like the centrifugal and centripetal forces, the two forces in our body act, the one in response to the other; and if in any given case the emotional centres were to be excited to such a degree that the controlling or cerebro-spinal organs lost their power, I see no reason why a person should not laugh, or cry, or move, under emotional impulse, until he died. In hysteria we see the effect of emotional impulse carried a long way towards death: in the dancing mania of the middle ages it was carried, in very many cases, to the actual catastrophe of death. What is more, we are not only conscious of the two natures, but we refer the emotional nature to its true seat. We say of sorrow, "it sits heavy on the heart;" and the glow of pleasure, or the gust of fear, are each immediately conveyed to us by sensations distinctly referable, not to the reasoning brain, but to the organic nervous cord.

The organic nervous chain exists, consequently, in the body, as a link between emotional mental acts and vascular supply; and the regulation of the blood in its course is made, to a certain, and often to an important degree, dependent on the accidents of emotion. An impression from without made, through the organs of the senses, upon the emotional centres, is reflected directly from them to the vascular expanse. The part flushes or blanches, and the heart hesitates, palpitates, rebounds, or intermits, according as the governing centre is excited or paralysed. Under the influence of grief or sorrow, or joy, or anxiety, these centres, excited or depressed, influence the waves of blood that are passing in their destined course through the arterial ramifications, and the brain itself, not less quickly than the other organs, feels the evil of the imperfect regulation of supply. Under the influence of agents acting upon the organic ganglia through the alimentary canal, of food held indigested in that canal, of bilious or other secretions undergoing decomposition there, of congestion of the great visceral organs of the abdomen, nay, even of external pressure on those organs, as from the prolonged pressure of the body on the desk in writing or in reading, the heart, for the same reasons, suffers. By any of these influences the organic nervous centres are excited or depressed, with the effect of induced irregularity of vascular tension, and with the sense of excitement or of lowness which of necessity attends.

Under undue mental work or strain, especially when that is of a kind which acts upon the emotional faculties, various phenomena of disease are apt to occur which are traceable to an interference with the vascular tonicity, and though they often are temporary and, it may be, trivial in character, are nevertheless causes of anxiety and too frequently of melancholic apprehension, in those who suffer. Thus, under varying tension of the vessels there are flushes, chills, coldness of the extremities, perspirations, irregular actions of the bowels, deficient tone in the stomach and intestines, with flatulency as a constant and oppressive symptom, and often a copious diuresis of a perfectly colourless secretion. In addition to these symptoms there are, at times, distressing, and even painful sensations, of ringing sounds in the head. These sounds are arterial murmurs; they are caused by the effect of pressure upon the relaxed arteries. In any point of the arterial tract where an artery runs through a rigid canal, as through the carotid canal in the base of the skull, the artery, when its walls are deficient in tension and relaxed, presses with each impulse of the heart on the resisting surrounding wall. Thereupon is vibration and murmur which, to the physician, may be detectable, by auscultation, in some parts of the body, and which, audible to the patient himself, in the case of vibration in the carotid bony canal, is compared by him to the sound of a rush of fluid in quick pulsation, or to a booming noise, a hissing or whistling note, or a tinkle like that of a bell. For the canal, from the sides of which the vibration proceeds, being in close proximity, indeed in direct connection by solid conducting substance, with the organ of hearing, the faintest vibration is detected. The sound produced, when it is sudden and unexpected, as in moments of extreme fear, is occasionally mistaken as a sound proceeding from without, with no obvious cause. I have known several instances, one notably in a member of my own profession, in which this audible vibration from arterial relaxation has been present at intervals, on occasions of nervous exhaustion, for many years. I have known such vibration mistaken for aneurism. I have known it to be developed instantaneously, and to subside with equal rapidity after a long continuance.

Together with these vascular murmurs and other signs of lowered arterial tension, there occur yet some temporary changes which give rise to alarm. A sudden sensation of numbness in a limb, or in the lip, is one of these signs; but a more common one is perturbed muscular action, snatches of the muscles, especially on going to sleep, and that curious muscular sensation or quiver to which the vulgar give the name of "live blood." When the muscular twitch, for it need not amount to spasm, is confined to the eyelid, or to the muscles of the extremities, it passes commonly for nothing; but sometimes it flies through the involuntary muscles, the diaphragm, the muscular coats of the œsophagus and alimentary canal, the muscles of the throat, and even the heart: then, transitory though it may be, it excites, especially at first, an unusual and not unnatural dread.

The phenomena above explained are, as a rule, temporary in character, and we are often accustomed to apply to them the term "hysteria." From a physiological, and I may also say from a practical, point of view, they may be considered as nothing more than a series of symptoms indicating reduced arterial tension. The changes of tension may be local or general, and the symptoms may simulate any form of local or general disease in which the organic nutrition is involved. The symptoms differ from the manifestations of true disease in that they are temporary in character,—suspensions of function, less disintegrations of structure.

CHAPTER IV.

INDUCED DISEASE FROM PHYSICAL STRAIN.

THERE is hardly a more difficult problem of our time than that of determining the natural bounds of physical labour. The subjects involved in the determination change with every age, are influenced by every invention, are stirred up or held in abeyance by variations in forms of government; are moved by literature,—by poetry especially,—by art, by tradition, by physical science, by geographical distinctions, and, lastly and most importantly, by the dire and personal necessities of every race.

In the progress of the lower to the higher phases of existence, in the progress of this age itself, we meet with many old standing principles and beliefs which defy calculation. The virtues of an age, whether they beassum ed or real, once established by whatever argument, become comparatively immortal : the old are never wanting as teachers of them, the young are never wanting as eager listeners and learners. Thus one age sets its seal upon the next, and many ages roll away before any impression of a distinct character is completely effaced.

At the same time, the known history of our species lends to us many useful truths, of which these two stand most prominent; firstly, that one of the highest ambitions men have realized has been the possession of great physical power; secondly, and in strange contrast, that the highest happiness men have hoped for, and have *not* realized, has been, and is, millennial rest, relief from physical labour, fatigue and pain.

The paradox, for such it seems to be at first, has a true meaning; it carries with it the well-written story of the steady development of the spiritual in the animal man; it signifies a reliance on that which is understood, however rude it may be; it indicates a hope for things not yet perfected which shall be better than the present.

In this modern day we live in transition, recognizing, with open sight, the higher part and compass of humanity, yet unable to cast off the tradition of the superlative value of animal strength and of excessive physical exertion.

Thus divided between two tastes and two sentiments, we are driven to receive with triumph every conquest of science for saving human labour, while we still retain the savage instincts of the ages when man had no resistance to offer to nature but his own personal physique and skill, and still exalt, with a wild enthusiasm, the half-naked athlete who strains nearly to death in the rowing match, or who disorganizes his body in attempting to walk a thousand miles in a thousand hours.

The scholar, who is determined to study nature by her own works, is bound, in considering these two very distinct positions, to let nothing like sentiment intrude on him. He may have strong leanings towards the intellectual development of man; he may have strong loathings against the remnant of savage life, its body-paint, its hoarse shrieks, its wild dances, and its herculean and swift-footed men;—its racers, gladiators, wrestlers, pugilists, physical heroes of all kinds. But whatever these differences of feeling, the scholar is bound to be impartial until he inquires and knows whether the savage arts are or are not necessary. He must ask: Do these arts contribute to the health and vitality of a race either collectively or individually; that is to say, are they necessary in order that a race may obtain the means of subsistence, and, whether necessary or unnecessary, do they contribute to the longevity and tenacity of the life of the men or the race through whom or through which they are represented? If the answer to this question be in the affirmative, the scientific scholar will at once give up all sentiment; he will acknowledge the necessity for the general continuance of the primitive or savage arts, and will at most seek to obtain a fair chance for intellectual or spiritual advancement, as the refining accompaniment, but in no sense the substitute of them.

In a nation so entirely uncivilized as to be obliged to trust to individual force alone for its means of life no physical culture can be too high, or too highly prized. Before a horse is tamed or a horse-shoe is invented for the uses of a community, the value of time, in all achievements requiring locomotion, is more than doubled; before the bow or other quick propelling instrument is discovered, the number of men demanded for the hunt or the battle-field must be many times greater than after such invention; and before the sails are set to the boat or ship, the hands required, for the simplest navigation, must be those of a host instead of a man. Thus the physical development of the individual, when the whole wants of the time rest upon it, becomes naturally, and one may say, properly, the highest virtue; it contrasts with nothing, for the simple reason that it stands above everything that is then intelligible and essential.

In a later age, even with a definite advance in civilization, but while still there is no motive force save that yielded by the animal kingdom, the continued predominance of the physical over the mental qualities is natural, in the fullest sense and degree; and we see in all this a reasonable basis for preference, extant possibly to this day amongst four out of every five of the inhabitants of the world, in favour of pure physical,—I mean by this, corporeal,—strength, and sustainment of physical endurance.

Such preference founded on the doctrine of necessity leaves no objection: it were a virtue, actually, to die for necessity, since, to the community, so to die were an absolute good. But, removing the doctrine of necessity and separating the individual from the community, the picture is reversed. There is no sign, there is no evidence anywhere that the greater culture of the physical strength has favoured the longevity of an individual or the vital tenacity of a race. The observations made by the physicians of the Greek, Roman, Arabian, and Italian schools, respecting excessive physical exercise and the maladies incident to it, admit of but one rigid interpretation, viz., that such exercise ensures premature decay and early death. The facts to be elicited in modern times from the vital statistics of this country, as well as of France and Prussia, lead equally to the inevitable conclusions, that removal of excessive physical endurance tends to health and length of life; and that in each country within its own population, the value of life is influenced, to the favourable side, by the reduction of physical expenditure. The most striking fact of this kind is afforded in that history of the Jewish race to which I have already adverted. In no period in the history of this wonderful people since their dispersion, do we discover the faintest approach to any system amongst them tending to the studied development of physical capacity. Since they were conquered they have never from choice borne arms nor sought distinction in military prowess; they have been little inducted, during their many pilgrimages, into the public games of the countries in which they have been located; their own ordinances and hygienic laws, perfect in other particulars, are indefinite in respect to special means for the development of great corporeal strength and stature; and the fact remains, that as a people they have never exhibited what is considered a high physical standard. To be plain, during their most severe persecutions nothing told so strongly against them as their apparent feebleness of body. And yet the broad truth stands forth, that this race has not only endured the oppression of centuries without being lost, but as it exists now, scattered here and there over the earth, in different countries and amongst the most varied social and natural conditions, it is of all civilized races the first in vitality.

It would be impossible, and in truth unnecessary, to enforce any stronger argument as to the negative value of excessive physical exertion in sustaining the vital power of a race. In the course of centuries the most powerful nations have died out, and empires of perfect physical beauty and chivalric fame have passed away. But through all these vicissitudes one race, cultivating none of the so-called athletic and heroic qualities, and following none of the exercises popularized as "bracing," "hardy," "invigorating," has held its irrepressible own, to remain a more numerous people, in its totality, than ever; a people still presenting a more tenacious life than its neighbours, and showing, as it is relieved of the cruel restraints long forced on it, the continuance also of mental force and of commanding genius, in art, in letters, in politics, in commerce, and in science.

Excessive physical exertion, then, while it is warranted by necessity and, under necessity, may rank as a virtue, is not absolutely requisite, as a thing of itself, for sustaining the vitality either of individuals or races: in other words, it is unnecessary either for sustaining vital power or mental endowment.

If it be asked, as a practical and immediate question :—In what manner does over-work of a physical kind injure or kill? the answer is easy.

During life, the forces by which the life is manifested are balanced against time—*i.e.*, an active development of power through mutable matter is brought into opposition with an immutable influence. The contest is unequal. The active animal machine must rest and recruit; time, an absolute immateriality, flows on unceasingly, destroying as it flows, silently and surely. Men hold the same position to time as solid bodies do to the current of a river: if they bend to the stream it destroys them slowly; if they stand against it, and breast it, and defy it, they are more conspicuous men for a season, but they are the sooner overwhelmed.

Again, the powers or forces of the body are limited by the size and capacity of the organism. Every degree of force which the body exhibits is the resultant of the force that is liberated in the combination of air with blood, or, to go to first principles, of air with food. The combustion of a pound of bread in the furnace of a steam engine would give rise to a certain measure of force, delivered in different series of times, according to the rapidity of the combustion. In the body the same pound of bread would virtually produce the same results—viz., so much force in a given time, according to the rapidity of the combustion. But as the body is constructed, its power of receiving food, which is its fuel, and its capacity for taking in air, are limited; hence the force which it can yield is limited, and hence, if the force put forth in a stated period be greater than that which ought to be put forth in that period, the extra force is expended at the expense of the organism itself, and by so much as is lost in any present effort, will so much be shortened in the future. For the body is not constituted to make up against time the slightest breath of force it has once lost. If it were constituted so to make up and recuperate, the problem of renewal of life would be solved, and individual death, which is now, in every case, the triumph of time, would be an avoidable event.

The exact mode of death from physical overwork is by the destruction of those parts of the body on which the involuntary acts of life depend, viz. the muscles and the nervous structures engaged in the digestion of food, the circulation of blood and the respiration. These organs and parts, which at the best never actually rest, become, when extra demand is put upon them, injuriously influenced; and as they are the most important, so their injury is most serious. When once they, one or all, fail, everything depending on them also fails. Usually, in cases of physical overwork, the heart goes first; but sometimes the muscles of respiration go equally early, or even take precedence in the bankruptcy of life. In either case, the stomach and other digestive organs follow in the track of failure, and the end is quickly pronounced.

When, moreover, the active organs begin to fail, a secondary evil arises, from what may be properly called a break of balance between vital organs. Within due limits, the body, during the first and second stages of life, has sufficient elasticity to allow of marvellous adaptations to varieties of form incident to labour; but even this quality may be trespassed on, and, in the case of the heart especially, mere disproportion of size and power may merge into fatal derangement of motion.

The heart by nature is endowed, as an active organ, with extreme powers of resistance and endurance; it also possesses in a limited degree the property of renovating itself, and even of becoming larger and more powerful as it is subjected to undue labour. Hence, in purely natural states of existence,—as in the primitive life, when good food and good air supply perfect blood for building up the tissues,—the heart will continue to an advanced age to support an action considerably beyond the merely required range of its functions. In our own country, in rural districts, we meet frequently with men who are accustomed to run, leap, carry heavy burdens, or walk unusual distances per day, until an advanced age, and without great suffering. On listening to the hearts of these men we find, however, the beat unnaturally strong; and as they approach their decline, they invariably complain of breathlessness, and of symptoms indicative of an oppressed circulation. Sometimes, under rest, the tendency to over-action ceases, the power of the heart accommodates itself to the diminishing power of the body, and the complete cycle of life is accomplished.

In this class of men we witness the simplest form of divergence from the natural state.

In large towns and cities where the air is impure, and the habits of the people are opposed to health, where in fact healthy animal tissues cannot be built up, we find a divergence similar in type to that given above, but much more extreme in character. We discover here, in men engaged in pursuits which call forth the whole of the bodily powers, that they suffer very early in life from over-action of the heart, the organ becoming in them enlarged and unduly excitable. They are subject from this cause to frequent and sudden congestion of the lungs and of other vascular organs. They cease to be uniformly and properly nourished, and great numbers of them die at, or even before, middle age, not because the heart itself has actually failed, but rather because it has tired out, by its over-action, the other vital organs that are dependent upon it. We have a good illustration of sufferers of this kind in the postmen of large cities, in carmen, in porters, and, amongst the higher classes, in those who indulge to an extreme degree in what are called athletic sports, such as foot-ball, boxing, rowing, leaping, running; sports, even less adapted to the man who has advanced out of the sphere of mere savage or animal existence, than to the uncivilized.

Details of Injuries from Physical Over-work.

I have indicated already that the influence of physical over-work tells mainly upon the heart, and, I might have added, upon the organs of circulation generally. It is necessary now that I should enter a little more minutely into detail, and thereby classify the particular characteristics of the changes induced, and of the work itself which induces such changes. I have no doubt that a great deal more could be written on this subject than I can record; but as I shall give the fruits of personal experience, the account, as far as it goes, may at least be relied upon as matter-of-fact observation.

(1.) The disease called aneurism,—especially aneurism of that large blood-vessel which rises from the left side of the heart to convey the arterial blood over the whole body,—the ascending aorta, is a malady I have frequently seen induced by excessive physical strain—particularly by strain which is oftentimes repeated. The great pathological anatomist, Morgagni, noticed this affection as common in his time amongst those who rode carriage-horses and, in our country, the disease thereupon obtained the name of "post-boy's malady." With a different civilization, this cause of aneurism has ceased; but it lingers yet, having its origin in causes similar, though less special. I have known it once occur in a man who was in early life a post-boy, and afterwards an outrider: once in an artilleryman, who traced the origin of it, in his case, to the great haste in which he had to mount his cannon, and to the severe concussion to which he was for a time subjected from travelling over rough ground: once in a gentleman who assigned for the cause of the first symptoms the practice of making extreme haste, on frequent occasions, to catch a train: three times in persons who were subjected to the effort of carrying weights up long flights of stairs.

In all these examples, the mechanical impulse by which the disease was induced was, practically, the same. The heart was working at high pressure, and the current of blood which should have flowed out of it through the great blood-vessel the aorta, instead of making its course in steady circuit, was brought back, by concussion, upon the heart. The semi-lunar valves which lie between the heart and the arterial tubes at the commencement of the arteries prevented the blood from directly re-entering the heart; so that upon these valves the column of blood fell like a water-hammer, with the effect of mechanically injuring the wall of the artery. After subjection for a long time to this treatment, the artery became permanently damaged. Its elastic coat lost its natural elasticity. The resilience lost, the vessel remained dilated. A little evil leads to a greater; and so at length, what was originally a resilient tube, became a passive pouch, ready to give way, upon some extra exertion, to let out the contained blood, and to ensure immediate death. In four of the instances I have referred to this was the mode of termination of life.

(2) There is a form of disease of the heart itself which may be fairly called wearing-out or wasting of that organ from undue exertion. This is most common in persons who practise physical exertion, not in a violent degree, but with long-continued persistency. It is common, for instance, amongst postmen; amongst working men who, in addition to their ordinary labours, walk long distances to and from their work; amongst travellers who take frequent and wearisome journeys on foot; amongst blacksmiths who work over-hours; amongst gentlemen who in field-sport

and similar occupations expose themselves to excessive physical fatigue; and, indeed, amongst all who labour too many hours a day in exhausting muscular exercise, which implies not short and sharp but prolonged and systematic strain. The waste of the heart in by far the greater majority of these examples begins in the walls of the right ventricle of the heart. We know, anatomically, that this ventricle, which has to keep the circuit of blood supplied through the lungs, is naturally much thinner than is the ventricle of the left side, which carries the blood over the body. If this ventricle, which has to make say 100,000 strokes in twenty-four hours, and thereby drive over the lungs 18,750 lbs. of blood, be taxed beyond its natural power of endurance; if it have not a certain number of hours, say eight, for what may be called easy work or play, and another certain number of hours, say eight more, for work at low pressure while the body sleeps, it must of necessity weary in its duty. But the heart is an *imperium in imperio*. It supplies itself with food,—that is to say with blood,—for its own nutrition, and whenever it fails to supply the body, it fails first to supply itself. Thus from overwork it soon becomes enfeebled, and most easily in that part of it which feels primary fatigue.

The feebleness of heart induced in the manner described, from gradual exhaustion, is felt but little in vigorous persons during the first and the earliest portion of the second term of life. Towards the close of the second term, and in the third term, the feebleness influences materially even the most powerful. Throughout all the terms, it influences seriously those who are naturally of feeble build, and those who cannot sustain work by ample supplies of nutritious food. None but the medical world know how many persons die from this one source of physical failure, or how insidiously the symptoms of worn-out heart make their progress through all classes of the labouring community.

The phenomena of disease indicating failure are that the victim of it begins to lose something of physical power; not in his limbs necessarily, but in what he calls his body. His breathing becomes embarrassed from slight causes of over-exertion. He requires to rest frequently. He suffers unduly from alternations of cold and heat. He is easily affected with congestion of the lungs, and with bronchial cough. He feels an internal exhaustion or vacuity, which he refers to his chest, and at last some actual organic changes, commencing in the lungs, the kidneys, or it may be the nervous centres, tend to death. Congestion of a general kind on the venous side of the body, leading to dropsical effusion, is a common cause of death from this mode of failure of the heart.

(3.) There is yet another organic change of the heart, arising from excessive muscular exertion, which differs from that last named in character, and in some respects in relation to cause. It consists in an undue muscular development of the circulating organ, and it is induced by a rapid series of strains or excessive exercises, carried on, as a rule, while the body is in its first stages of growth. The heart in these instances becomes, to use a simple phrase, too powerful and too irritable, for the purposes for which it was naturally destined in the body. Its muscular structure is unduly developed on both sides; the tension of its stroke upon the arteries and upon the vascular organs is too severe; and if the nervous power by which it is governed be not proportionately balanced, and be not equal to the charge of controlling it, it becomes irregular in its motion and in its work. These conditions are most potently encouraged in the pursuit of those exercises of training for great contests of physical prowess by which our nation has become so characteristically distinguished.

It will be anticipated that I refer here, more particularly, to those exercises of training for the boat-race, the foot-race, and other similar competitions. It is no object of mine to underrate the advantages of physical exercise for the young, but I can scarcely overrate the dangers of those fierce competitive exercises which the world in general seems determined to applaud. I had the opportunity once in my life of living near a great trainer, himself a champion rower. He was a patient of mine, suffering from the very form of induced heart-disease of which I am now speaking, and he gave me ample means of studying the conditions of many of those whom he trained both for running and for rowing. I found occasion, certainly, to admire the physique to which his trained men were brought; the strength of muscle they attained, the force of their heart; but the admiration was qualified by the stern fact of the results. The state of perfection arrived at was, at best, artificial and was sustainable for but a brief period. The mode of life necessary for perfection was itself incompatible, beyond a limited time, with the ordinary necessities and requirements of life, and when the artificial system ceased, when the voluntary muscles, sustained by force of the will ready for instant and violent effort, were allowed to lapse down to the ordinary tone, then the involuntary muscles, the heart especially, which could neither be bidden nor permitted to lapse in the same way, remained in strength out of all due proportion greater than the rest of the active moving parts of the organism.

We anatomists say that a heart thus circumstanced is hypertrophied,—that is, it is relatively enlarged, as compared with other parts of the body. When this is so, all the other parts feel the influence injuriously. The affected person is painfully conscious of the undue action of his heart. The breathing is oppressed, and the muscular tone, instead of being increased, is now also reduced, so that movement is laborious, breathless and even exhaustive. I could, if such detail were befitting, put forward many illustrations of this class of injury. Happily, the injury is sometimes corrected when the subject of it is very young; for in the development of the body the other parts and organs by their increasing growth became adapted, to a certain extent, to the powerful heart. But if the disproportion be induced late in the first term of life, the injurious effect, which is never eradicated, is one of the most certain causes of premature disorganization of remote organs, and of comparatively early death.

I have dwelt on the subject of competitive animal prowess, because there is connected with it commonly a fatal and a vulgar error. We hear men, and statesmen, speaking enthusiastically of competitions of strength as though they were the backbone of the physical life of England. The assumption is a foolish error. By skilful training, it is quite true that men may be, and are, brought to a fine external standard; but the external development is so commonly the covering of an internal and fatal evil that I venture to affirm there is not in England a trained professional athlete of the age of thirty-five, who has been ten years at his calling, who is not disabled. He may hold on, sustained by a will which cannot bend to defeat: he may win bravely; then win, and only just win: then tie some new antagonist; then lose, and, urged by friends whose ardour is damped, retire; but he will soon die. The falling off which has been observed by patrons or admirers before actual failure, means, not want of skill, not stiffness of joint, but actual overworked, worn-out heart and blood-vessel; it means, in fact now, a race for life rather than for fame. In my professional work I have been in attendance on as many as seven men thus brought to incapacity, before the middle term of their lives, who by virtue of their fine organizations might, and, in all human probability, would have lived to a vigorous old age under a system of exercise less lawless against nature and less suicidal.

CHAPTER V.

DISEASE FROM COMBINATION OF PHYSICAL WITH MENTAL STRAIN.

THE evils of physical overwork are often increased by admixture of labours which are not akin. This fact is frequently evidenced in the volunteer movement. To men already engaged in active out-door pursuits, volunteering may, for a time, be harmless; but to those who are confined within doors all day, violent exertion at drill and on march, after the ordinary work is over, is most prejudicial. I recall with much pain, as I write, many facts that have entered into my experience on this subject. There is before me the remembrance of a young man whose promise in life was most enviable. A student, a scholar, rich in wit, happy in debate, affectionate in disposition, and generally beloved. Here on the table lies his legacy to me, a volume of speeches, on which his own natural and telling eloquence was to be modelled. He had an agreeable literary occupation, and prospects unusually happy. But one unlucky day the zest for volunteer training seized him, and, with that enthusiasm which marked him in all he did he must go into training heart and soul. Naturally of a build but moderately strong, he entered into physical competition with men inured to fatigue, and of far greater strength. His day's work, itself sufficiently laborious, over, he must away to the drill, and then to the march, and must go from town long distances, to step into it again, keeping up with the rest of the corps. One night, after a busy day, he accomplished a march of twelve miles, and thereupon his course in the march of life was finished. His labouring perplexed heart could bear no more. Had he met with an accident and blown off a hand or a foot, it had been lamentable, but it were as nothing to that night's march. He simply went home to struggle through a few months of misery and to die. I could multiply examples of this kind; and I could show also that it is not always persons of light and feeble build who suffer, for I have, indeed, seen men who, having waxed fat, have joined a corps "to work themselves down," succumb under the exertion with startling rapidity.

Whether, granting the volunteer system to be a necessity, the exercise of the volunteer need be so severe, I cannot say; that is a question for the drill-sergeant and commanding officer to answer. It is my business simply to indicate that the service, as it is now carried on, is too severe for the majority of overworked Englishmen; that it cannot be maintained safely as an appendage to the ordinary labours of the day, and that when the enthusiasm attending it, and which has called forth the excess of energy we have heretofore seen, fails to operate, the movement altogether will gradually give way before the pressure of that daily work which must, *nolens volens*, be accomplished by the mass of the people.

An error different from that implied in volunteering, yet having the same results, consists in making long journeys to and from business occupations. In the old times our forefathers who had attained a competency in business indicated the fact by taking an extra house a little way from town, at some distance, that is to say, from the place where they had laboured to amass their wealth. In course of time, this process extended itself, and the place of business and the private house became essential, not for those who had won, but for those who were striving to win. The introduction of the railway system tended greatly to facilitate the desire for possession of town and country house, and in this day we have, in all our large cities and towns, men who are leaving their chambers, their offices, their consulting-rooms every evening in great haste, that they may arrive at the train or other conveyance that will take them a journey of some miles to their homes. Again every morning the same men, usually in very great haste, leave their homes to return to business. If this double process of travel could be performed daily with deliberation, and without exposure to physical or mental shock, it would be free of danger, and perhaps, on the whole, conducive to health. For the man who can partly retire, and can pursue business as he lists, it is, I believe, conducive to health; but to the struggling man who is in the meshes of an active life, few processes are more destructive. The elements of danger are many. There is the annoyance which springs from danger of absence from business; there is the haste to return from home to business; there is the temptation to remain occupied to the last possible moment, and to risk an exceeding hurry in order to join the family circle at an appointed hour; there is the tendency to become irregular in the method of meals, to take a hasty breakfast, to work during the day on imperfect snatches of food, and late in the evening, when the stomach, like the res of the body, is wearied, to compensate for previous deficiencies by eating an excessive meal Lastly, there is the evil that some work, which might easily have been done during the hours sacrificed to travelling is brought home to be completed at night, when the tired body should be seeking its natural repose.

I take care to specify these processes, because my experience tells me I can hardly overrate the objections that may be urged against them. They create a feverish inaptitude for real work; a wearied inaptitude for real play. They make life a constant labour, and they add to the necessities of labour a persistent unnecessary exertion. The result is a premature decline of life, preceded by a series of diseased phenomena, which often, in what should be the hey-day of physical enjoyment, render existence a positive burden.

The phenomena of disease presented under these circumstances are varied in intensity, but are comparatively uniform in character. They are marked, primarily, by what may be called an intense precipitation of labour, a constant struggle to do everything, be it little or great, instantly, that is off-hand; and by a determination, against which there shall be no impediment, that the work of each day shall be borne in the day. Amongst men thus toiling, the fault of putting off till to-morrow what should be done to-day is replaced by the much more serious fault of doing to day what should be done to-morrow. The precipitation engenders doubt, doubt constantly recurring, whether what has been done could not have been better done; and this doubt, commonly beyond rectification, begets either a feeling of annoyance, which wears out the mind, or a feeling of recklessness, which, by frequent and useless correction, is not less wearying. In plain words, the quick emotional or instinctive faculties act out of accord with, or in opposition to, the reasoning faculties, so that the body which should naturally be united into a compact organic whole by the communion of its two natures, is rent by them and before it has learnt to reason perfectly, has commenced to fail in physical power.

The immediate symptoms of disease in these examples appear through both the nervous and vascular systems. The nervous phenomena are those of unnecessary anxiety, timidity, restlessness, inability to sleep, quickness of temper, especially when great despatch is called for, and an ever-recurring sense of exhaustion, referred usually to the stomach, as though food or drink, against which the stomach rebels, were required to sustain the flagging energy. The vascular symptoms are an irregular circulation, a constant irritability of the heart, an imperfect state of the secretions, a coldness of the extremities from a deficient supply of blood and a want of muscular power from the same cause.

According to local weakness peculiar to the individual or inherited by him, these general symptoms frequently glide into some local disorder. If the proclivity of the person be to cancer, or consumption, or fatty degeneration, or diabetes, or paralysis, or apoplexy, or epilepsy, the conditions are laid for the development of these disorders. Or if, happily, none of these proclivities be present, then the conditions are laid for a lapse, a little later on, into simple premature decay

The effects of travelling, I mean the motion implied by a double daily journey and by the circumstances connected with it, add in a little time, intrinsically, to the evils which have been portrayed. The haste made to catch the train: the confusion, noise, and bustle of the railway station; the shriek of the engine; the start from and stoppage at various stations; the perpetual vibration communicated through the carriage to the body; the closeness of the carriage or the draught through it; the desire in the carriage to fill the time by reading, controversy, joking or games of chance; — these influences all contribute most materially to injure the life of the man who subjects himself to them, be he ever so strong, careful, and collected.

Many persons who have suffered from persistent railway travelling have told me of one particular subjective symptom which deserves attention. They feel on seating themselves in the carriage a peculiar nervous restlessness and even faintness, which passes away so soon as the carriage is in motion, but which returns with so much increased intensity as the train stops, that actual giddiness or half unconsciousness, with desire to bend forward and find something for support, supervenes. This particular sign I note as of singular import. It tells of threatened organic change in the nervous matter; it is a forecast of paralytic seizure, and should never be allowed to pass without the correction of it which can only come from complete withdrawal from the cause; that is to say, from the motion and excitement of the railway life.

Another phenomenon indicating an injurious action upon the nervous matter, and of which I have heard travellers by railway complain, is a peculiar sensitiveness amounting even to pain, in the course of the spinal column, followed in course of time by some certain though it may be slight sensation of want of steadiness in the lower limbs on first alighting from the train. The sensitiveness seems to be due to a vibration communicated from the carriage to the body, and to extend from the lower part of the spinal column upwards to the neck. These symptoms, often repeated, become at last a natural source of alarm. They pass away after a few days' rest, and I have no knowledge of any instance in which they have merged into serious organic disease. They are nevertheless ominous symptoms, and are worthy therefore of this passing record.

CHAPTER VI.

ON DISEASE FROM THE INFLUENCE OF THE PASSIONS.

MANY of the forms of disease which have been detailed in the last three chapters may be induced by other causes than worry or mental strain. They may be the effects of the unrestrained influence of certain of the passions. I say certain of the passions, because all do not seem to act with the same intensity. Some of them act with a sharpness of intensity that is peculiar, while others apparently excite no physical injury.

The passions which act most severely on the physical life are anger, fear, hatred, and grief. The other passions are comparatively innocuous. What is called the passion of love is not injurious until it lapses into grief and anxiety; on the contrary, it sustains the physical power. What is called ambition is of itself harmless; for ambition, when it exists purely, is a nobility lifting its owner entirely from himself into the exalted service of mankind. It injures when it is debased by its meaner ally, pride; or when, stimulating a man to too strenuous efforts after some great object, it leads him to the performance of excessive mental or physical labour and to the consequences that follow such efforts.

The passion called avarice, according to my experience, tends rather to the preservation of the body than to its deterioration. The avaricious man, who seems to the luxurious world to be debarring himself from all the pleasures of the world, and even to be exposing himself to the pangs of poverty, is generally placing himself in the precise conditions favourable to a long and healthy existence. By his economy, he is being saved from all the worry incident to penury; by his caution, he is being screened from all the risks incident to speculation or the attempt to amass wealth by hazardous means; by his regularity of hours and perfect appropriation of the sunlight, in preference to artificial illumination, he rests and works in periods that precisely accord with the periodicity of nature; by his abstemiousness in living he takes just enough to live, which is precisely the right thing to do, according to the rigid natural law. Thus, in almost every particular, he goes on his way freer than other men from the external causes of all the induced diseases, and better protected than most men from the worst consequences of those diseases which spring from causes that are uncontrollable.

I do not hold up this picture as an encouragement to avarice, for an avaricious world would truly be a sad one. "But there is a soul of goodness in things evil, would men observingly distil it out," and, certainly, much goodness might be observed even in the perverted passion of avarice, if reckless and over-generous men would condescend to the distillation.

Some of the most extreme instances, at all events, nay, the most typical instances, of longevity with perfect physical health that I have met with, have been in those who are tinctured practically with the passion under consideration. It is true some have not been happy, and none eminently useful; but to the physiological mind they present a remarkable picture of the endurance of health and life under what are nearest to the natural conditions necessary for both. They suggest that if with this physical standard a higher and nobler mental development could be attained, with art and science and benevolent labours as the pleasures added to the life, the approach to perfection of existence would be closely realised, and the age, not of the man only but of the world of life to which he belongs, would be more thoughtfully conserved.

Effects of Anger.

Of the passions I have enumerated as most detrimental to life, anger stands first. He is a man very rich indeed in physical power who can afford to be angry. The richest cannot afford it many times without ensuring the penalty, a penalty that is always severe. What is still worse of this passion is, that the very disease it engenders feeds it, so that if the impulse go many times unchecked it becomes the master of the man.

The effects of passion are brought out entirely through disturbance in the organic nervous chain. We say a man was "red" with rage, or we say he was "white" with rage, by which terms, as by degrees of comparison, we express the extent of his fury. Physiologically we are then speaking of the nervous condition of the minute circulation of his blood: that "red" rage means partial paralysis of minute blood-vessels: that "white" rage means temporary suspension of the action of the prime mover of the circulation itself. But such disturbances cannot often be produced without the occurrence of permanent organic evils of the vital organs, especially of the heart and of the brain.

The effect of rage upon the heart is to induce a permanently perverted motion, and particularly that perverted motion called intermittency, of the nature of which the reader has already been informed.

One striking example, amongst others of this kind which I could name, was afforded me in the case of a member of my own profession. This gentleman told me that an original irritability of temper was permitted, by want of due control, to pass into a disposition of almost persistent or chronic anger, so that every trifle in his way was a cause of unwarrantable irritation. Sometimes his anger was so vehement that all about him were alarmed for him even more than for themselves, and when the attack was over there were hours of sorrow and regret, in private, which were as exhausting as the previous rage. In the midst of one of these outbreaks of short, severe madness, he suddenly felt, to use his own expression, as if his "heart were lost." He reeled under the impression, was nauseated and faint: then, recovering, he put his hand to his wrist, and discovered an intermittent action of his heart as the cause of his faintness. He never completely rallied from that shock, and to the day of his death, ten years later, he was never free from the intermittency. As a rule he was not conscious of the intermittency unless he took an observation on his own pulse, as though he were apart from himself: but occasionally after severe fatigue he would be subjectively conscious of it, and was much distressed and depressed. "I am broken-hearted," he would say, "physically broken-hearted." And so he was: but the knowledge of the broken heart tempered, marvellously, his passion, and saved him many years of a really useful life. He died ultimately from an acute febrile disorder.

The effect of anger upon the brain is to produce first a paralysis, and afterwards, during reaction, a congestion of the vessels of that organ; for, if life continues, reactive congestion follows paralysis as certainly as day follows night. Thus, in men who give way to violent rage there comes on, during the acute period, what to them is merely a faintness, which, after a time of apparent recovery, is followed by a slight confusion, a giddiness, a weight in the head, a sense of oppression, and a return to equilibrium. They are happy who, continuing their course, suffer no more severely. Many die in one or other of the two stages I have named. They die in the moment of white rage, when the cerebral vessels and heart are paralysed. Then we say they die of faintness, during excitement. Or, they die more slowly when the rage has passed and the congestion of reaction has led to engorgement of the vessels of the brain. Then the engorgement has caused stoppage of the circulation there; or a vessel has given way: or serous fluid has exuded, producing pressure, and we report that the death was from apoplexy, following upon excitement.

Effects of Hatred.

Hatred, when it is greatly intensified, acts much like anger in the effects it produces. The phenomena differ in that they are less suddenly developed and more closely concealed; they very rarely, in fact, come under the cognizance of the physician unmixed with other phenomena. They are made up of the symptoms of suppressed anger with morose determination, and they keep the sufferer from rest. He is led to neglect the necessities of his own existence; he is rendered feverish and feeble; and at last he either sinks into chronic despondency and irritability, or rushes hastily to the performance of some act which indicates disordered mind.

Effects of Fear.

The effects of fear are all but identical with those of rage, and like rage grow in force with repetition. The phenomena are so easily developed in the majority of persons, that they may actually be acquired by imitation, and may be intensified and perhaps induced by listening to the mere narratives of events which act as causes of fear. I am daily more and more convinced that not half the evils resulting from what may be called the promptings of fear in the young and the feeble are duly appreciated, and that fear is the worst weapon of physical torture the thoughtless coward wields. The organs upon which fear exerts its injurious influence are, again, the organic nervous chain, the heart, and the brain.

Permanent intermittency of the heart is one of the leading phenomena incident to sudden and extreme terror. One example, sufficiently characteristic, will illustrate this fact.

A gentleman of middle age was returning home from a long voyage in the most perfect health and spirits, when the vessel in which he was sailing was struck from a collision, and, hopelessly injured, began to sink. With the sensation of the sinking of the ship and the obvious imminence of death,—five minutes was the longest expected period of remaining life,—this gentleman felt his heart, previously acting vehemently, stop in its beat. He remembered then a confused period of noise and cries and rush, and a return to comparative quiet, during which he discovered himself being conveyed, almost unconsciously, out of the sinking vessel on to the deck of another vessel that had rendered assistance. When he had gained sufficient calmness he found that periods of intermittent action of his heart could be counted. They occurred four and five times in the minute for several days, and interfered with his going to sleep for many nights. On reaching land the intermittency decreased, and when the patient came to me, soon afterwards, there were not more than two intermittent strokes in the minute, all the intervening strokes being entirely natural and the action of the heart and the sounds of it being simply perfect. In this gentleman the intermittent pulse became a fixed condition, but so modified in character that it was endurable. At his last visit to me he was not conscious of the symptom except he took it objectively from himself, by feeling his own pulse or listening to his own heart.

The effect of fear on the brain may be to the extent of that which is produced by extremity of rage, so that even sudden death, from syncope, may ensue. I have known two such instances as these, but the more common effect is an intense irritability, followed by doubt, suspicion and distrust, leading towards or to insanity. From a sudden terror deeply felt the young mind rarely recovers, never I believe, if hereditary tendency to insanity be a part of its nature. A man, who is now the inmate of an asylum, owing to fixed delusions that all his best friends are conspiring to injure and kill him, explained to me, before his delusion was established, from what it started. When he was a boy he had a nervous dread of water, and his father, for that very reason, and with the best of intentions, determined that he should be taught to swim. He was taken by his tutor, in whom he had every confidence, to the side of a river, and when he was undressed he suddenly found himself cast by his instructor, without any warning, into the stream. No actual danger of drowning was implied, for the tutor himself was at once in the water to hold him up or to bring him to land; but the immediate effect, beginning with the faintness of fear, was followed by vomiting, by a long train of other nervous symptoms, by constant dread that some one was in some way about to repeat the infliction, by frequent dreaming of the event by night, by thinking upon it in the day. At last, all the phenomena culminated in that breach between the instinctive and the reasoning powers which we, for want of a better term, call dangerous and insane delusion.

Effects of Grief.

The effect of grief varies somewhat according to the suddenness or slowness with which it is expressed. Sudden grief tells chiefly upon the heart, leading to irregular action, and to various changes in the extreme parts of the circulation incidental to such irregularity. Under sudden impulse of grief I have known singular local manifestations of disease, as for instance the development of a *goître;* an hæmoptysis or loss of blood from the lungs; a local paralysis of the lip and tongue; a failure of sight.

When the grief is less sudden and more prolonged, want of power and intermittency of the circulation are again the most common phenomena. They are most easily developed in women, but I have seen them occur even in men of strong habit but sensitive feeling. Thus a gentleman whom I know well, and who suffers in the way I describe, tells me that he first became conscious of the intermittency in the action of his heart, upon the anxiety he felt from the loss of one of his brothers, to whom he was deeply attached and for whose superior talents he had, as indeed many others had, a profound admiration. The attacks at first were so severe that they created in his mind some alarm; but in course of time he became accustomed to them, and the sense of fear passed away. The intermittency in this instance alternated with periods in which there was very slight interruption of natural action. During the more natural periods there was however an occasional absence of stroke once in two or three hundred beats, but the fact was not evident to the subject himself. When the extreme attacks were present the intermittency of pulse occurred six or even seven times in the minute, and the fact, which was subjectively felt, was very painful. The stomach at the same time was uneasy, there was flatulency, and a sensation of sinking and exhaustion. In the worst attacks there was also some difficulty in respiration, and a desire for more capacity for air, but unattended by spasm or acute pain. A severe attack was induced readily by any cause of disturbance, such as broken rest or mental excitement; on the other hand, rest and freedom from care seemed to him curative, for a time.

In this gentleman another symptom was presented for one or two years, which is somewhat novel, and exceedingly striking. The symptom was this. When the intermittent action of the heart was at its worst, there came on in the fingers of one or other hand a sensation of coldness and numbness, followed instantly by quick blanching of the skin, precisely the same appearance, in fact, as is produced when the surface of the body is frozen. The numbness and temporary death of the parts would often remain for a full hour, during which time the superficial sensibility was altogether lost. When recovery commenced in the fingers it was very rapid, and after recovery no bad results were ever noticeable. I have since seen one similar illustration in another individual, occurring under nearly similar circumstances.

From the irregularity of the circulation of the blood induced by prolonged grief, varied central phenomena in the nervous matter follow, and in persons who have passed middle life these phenomena are usually permanent if not progressive. They consist of organic feebleness extending to all the active organs of the body, and affecting specially the mental organism. A constant desire for rest, for avoidance of cares, for seclusion, mark this stage of disease, if so it may be called. It is not necessarily a stage leading to rapid failure of further physical or mental power, for the mind and body are subdued so equally there is no galling irritability, no wearing depression from the influence of other passions. The worst that happens ultimately in those instances is the gradual but premature encroachment of dementia previous to death, if the life be prolonged to its natural term.

The Reel of the Passions.

Under some circumstances the passions, excited in turn, injure by the combined influence of their action. In games of chance where money is at stake we see the play of the worst passions in all its mischievous intensity. Fear and anger, hate and grief, hope and exultation, stand forth, one after the other, keeping the trepitant heart in constant excitement and under tremulous strain, until at length its natural steadiness of motion is transformed into unnatural irregularity, which, if it do not remain permanent, is called up by the slightest irritation. The act of playing at whist for high stakes is a frequent source of disease from this cause. I know that professed or habitual card-players declare that, however much may be played for, the losses and winnings of games are equalized by turn, and that after a year's play the player has, practically, neither won nor lost. I may accept that what is declared on this point is true; but the fact, if it be one, does not alter the physical evil that results one iota. The man who, after being engaged in business all day, sits down regularly at night to play his rubbers on rubbers, to stake heavily on his games, to bet on his odd tricks, never, I believe, escapes the effects of organic nervous shock. Some of the worst forms of such shock I have seen have sprung from this cause.

Political excitements call forth readily the reel of the passions with dangerous energy. A few specially constructed men, who have no passions, pass through active political excitement and, maybe, take part in it without suffering injury; but the majority are injured. As they pour forth their eloquent or rude speeches, as they extol or condemn, as they cheer or hiss, as they threaten or cajole, they are taking out of themselves force they will never regain.

It has been observed since the time of Pinel, that when to political excitement there is added the excitement of war, especially of civil war, the effects on the physical life of the people are at once marked by the disturbance of nervous balance. This fact was forcibly illustrated during and after the last great civil war in America, and it formed the subject of several most able reports by the physicians of that country. One report, by Dr. Stokes, of the Mount Hope Institution of Baltimore, was, I remember, a masterly history which, when the time comes that war shall be no more, will be read with as much wonder as we now read of the witch or dancing mania of the middle ages. One victim of the war mania is cursed with fear until he fails to sleep; another believes all his estates are confiscated; a third imagines himself taking part in some bloody fray; a fourth, the subject of aural delusions, no sooner sleeps than he wakes up, roused by what he considers to be awful sounds afar off, but approaching nearer. These are the more visible evidences of the injuries of war beyond those inflicted on the fighting men. They represent much, but they represent little if they be compared with the minor but still formidable physical injuries to the heart and brain which stop short of real insanity, but which reduce life, and which pass in line from the generation that receives them primarily, to the generations that have to come.

The reel of the passions as a cause of diseases of modern life rests not with the excitements of gaming, of political strife, of war. It is stirred up by some fanatical manifestations for the regeneration of the world, which are well meant, but which, missing the mark, plant degeneration instead.

In a sentence, whenever from undue excitement of any kind the passions are permitted to overrule the reason, the result is disease: the heart empties itself into the brain; the brain is stricken, the heart is prostrate, and both are lost.

CHAPTER VII.

ON DISEASE FROM ALCOHOL. PHYSIOLOGICAL PROEM.

To have to speak of diseases originating from the use of a fluid which, next to water, forms a part of the daily beverage of immense populations of civilized peoples seems a satire on civilization. It is nevertheless the duty of every physician to speak plainly on this subject, because it is his painful task, day by day, to treat the most terrible and fatal diseases, for the origin of which he can assign no other cause than the use of alcohol.

It adds to the pain of the physician, while he makes these observations, to feel that when he calls to his aid the study of physiological laws, he can find no place for alcohol as a necessity of life. He contemplates its action on living function to discover that it supplies no force to living matter, and no new matter, that is of natural character, for the construction of organized tissue.

In whatever direction he turns his attention to determine the value of alcohol to man, beyond the sphere of its value as a drug which he may at times prescribe, he sees nothing but a void : in whatever way he turns his attention to determine the persistent effects of alcohol he sees nothing but disease and death : mental disease, mental death : physical disease, physical death.

We approach most safely to the facts of the injuries that are induced by alcohol, through the study of its physiological action; the part it plays when it enters the living organism. In whatever form it enters, whether as spirit, wine, or ale, matters little when its specific influence is kept steadily in view. It is as alcohol in its pure form, as the ardent spirit of the old writers, the ethylic alcohol of modern chemists and the basis of all our common intoxicating drinks, that it is best studied. To say this man only drinks ale, that man only drinks wine, while a third drinks spirits, is merely to say, when the apology is unclothed, that all drink the same danger.

The effects produced by alcohol are common, as far as I can discover, to every animal. Alcohol is a universal intoxicant, and in the higher orders of animals is capable of inducing the most systematic phenomena of disease. But it is reserved for man himself to exhibit these phenomena in their purest form, and to present, through them, in the morbid conditions belonging to his age, a distinct pathology. Bad as this is, it might be worse; for if the evils of alcohol were made to extend equally to animals lower than man, we should soon have none that were tameable, none that were workable, and none that were eatable.

Action of Alcohol on Vital Functions. The First Stage. Stage of Vascular Nervous Excitement.

Ethylic alcohol will enter the animal body by any channel through which it can be administered. It can be introduced by the stomach, by the connective tissue beneath the skin, into which it can be readily injected, and by the inhalation of its vapour by the lungs. The last method of administration is the most difficult, the quantity of vapour required for the production of an effect being considerable, and the time required very long. But in whatever mode it may enter into the living body so as to produce modification of physiological action, the changes it excites are remarkably uniform, and, *cæteris paribus*, the amount necessary to induce the changes is uniform. Thus, I have found, by direct research, that the proportion of thirty grains of alcohol to the pound weight of the animal body, is the quantity capable of producing intoxication, while an increase of this amount to sixty grains, is productive of immediate danger.

The order and course of the changes induced are in like manner, uniform. The first symptom of moment that attracts attention, after alcohol has commenced to take effect on the animal body, is what may be called vascular excitement; in other words, over-action of the heart. The heart beats more quickly, and thereupon the pulse rises. There may be some other symptoms of a subjective kind,—symptoms felt by the person or animal under the alcohol,—but this one symptom of vascular excitement is the first objective symptom, or that which is presented to the observer. I once endeavoured, in research, to determine from observations on inferior animals what was the actual degree of vascular excitement induced by alcohol, and my results were full of interest. They have, however, been superseded by the observations made on the human subject by Dr. Parkes and the late Count Wollowicz.

These observers conducted their inquiries on the young and healthy adult man. They counted the beats of the heart, first at regular intervals, during what were called water periods, that is to say, during periods when the subject under observation drank nothing but water; and next, taking still the same subject, they counted the beats of the heart during successive periods in which alcohol was taken in increasing quantities. Thus step by step they measured the precise action of alcohol on the heart, and thereby learned precisely the primary influence of alcohol. Their results generally were as follows :—

The average number of beats of the heart in 24 hours (as calculated from eight observations made in 14 hours) during the first, or water period, was 106,000; in the first alcoholic period it rose to 127,000, or about 21,000 more; and in a later stage to 131,000, or 25,000 more.

The subjoined details are from their own report :—

"The highest of the daily means of the pulse observed during the first or water period was 77·5; but on this day two observations were deficient. The next highest daily mean was 77 beats.

"If, instead of the mean of the eight days, or 73·57, we compare the mean of this one day, viz., 77 beats per minute, with the alcoholic days, so as to be sure not to over-estimate the action of the alcohol, we find :—

"On the 9th day, with one fluid ounce of alcohol, the heart beat 430 times more.

"On the 10th day, with two fluid ounces, 1,872 times more.

"On the 11th day, with four fluid ounces, 12,960 times more.

"On the 12th day, with six fluid ounces, 30,672 times more.

"On the 13th day, with eight fluid ounces, 23,904 times more.

"On the 14th day, with eight fluid ounces, 25,488 times more.

"But as there was ephemeral fever on the 12th day, it is right to make a deduction, and to estimate the number of beats in that day as midway between the 11th and 13th days, or 18,432. Adopting this, the mean daily excess of beats during the alcoholic days was 14,492, or an increase of rather more than 13 per cent.

"The first day of alcohol gave an excess of 4 per cent., and the last of 23 per cent.; and the mean of these two gives almost the same percentage of excess as the mean of the six days.

"Admitting that each beat of the heart was as strong during the alcoholic period as in the water period (and it was really more powerful), the heart on the last two days of alcohol was doing one-fifth more work.

"Adopting the lowest estimate which has been given of the daily work done by the heart, viz., as equal to 122 tons lifted one foot, the heart, during the alcoholic period, did daily work in excess equal to lifting 15·8 tons one foot, and in the last two days did extra work to the amount of 24 tons lifted as far.

"The period of rest for the heart was shortened, though, perhaps, not to such an extent as would be inferred from the number of beats; for each contraction was sooner over. The heart, on the fifth and sixth days after alcohol was left off, and apparently at the time when the last traces of alcohol were eliminated, showed, in the sphygmographic tracings, signs of unusual feebleness; and, perhaps, in consequence of this, when the brandy quickened the heart again, the tracings showed a more rapid contraction of the ventricles, but less power, than in the alcoholic period. The brandy acted, in fact, on a heart whose nutrition had not been perfectly restored."

It is difficult, at first glance, to realize the excessive amount of work performed by the heart under this extreme excitement. Little wonder is it that, after the labour imposed upon it by six ounces of alcohol, the heart should flag; still less the cause for wonder that the brain and muscles, which depend upon the heart for their blood supply, should be languid for many hours and should require the rest of long sleep for renovation. It is hard physical work, to fight against alcohol.

While the heart is thus working under the action of alcoholic stimulation, a change is observable in the extreme circulation, that circulation of blood which by varying shades of colour in exposed parts of the body, such as the cheek, is visible to the eye. The peripheral circulation is quickened, the vessels distended. We see this usually in persons under the influence of wine in the early stage, and we speak of it as the flush produced by wine.

From common observation, the flush seen on the cheek during the first stage of alcoholic excitement is supposed to extend merely to the parts actually exposed to view. It cannot, however, be too forcibly impressed on the mind of the reader that the condition is universal in the body. If the lungs could be seen, they, too, would be found with their vessels injected; if the brain and spinal cord could be laid open to view, they would be discovered in the same condition; if the stomach, the liver, the spleen, the kidneys, or any other vascular organs or parts could be laid open to the eye, the vascular engorgement would be equally manifest. In the lower animals I have been able to witness this extreme vascular condition in the lungs, and once I had the unusual, though unhappy opportunity of observing the same phenomenon in the brain of a man who, in a paroxysm of alcoholic delirium, cast himself under the wheels of a railway carriage. The brain, instantaneously thrown out from the skull by the crash, was before me within three minutes after the accident. It exhaled the odour of spirit most distinctly, and its membranes and minute structures were vascular in the extreme. It looked as if it had been recently injected with vermilion injection. The white matter of the cerebrum, studded with red points, could scarcely be distinguished when it was incised, it was so preternaturally red; and the pia mater, or internal vascular membrane covering the brain, resembled a delicate web of coagulated red blood, so tensely were its fine vessels engorged. This condition extended through both the larger and the smaller brain, cerebrum and cerebellum, but was not so marked in the medulla or commencing portion of the spinal cord, as in the other portions.

In course of time, in persons accustomed to alcohol, the vascular changes, temporary only in the noviciate, become confirmed and permanent. The bloom on the nose which characterizes the genial toper is the established sign of alcoholic action on vascular structure.

Recently, physiological research has served to explain the reason why, under alcohol, the heart at first beats so quickly, why the pulses rise, and why the minute blood-vessels become so strongly injected.

At one time it was imagined that alcohol acts immediately upon the heart, by stimulating it to increased motion; and from this idea,—false idea, I should say,—of the primary action of alcohol, many erroneous conclusions have been drawn. We have now learned that there exist many chemical bodies which act in the same manner as alcohol, and that their effect is not to stimulate the heart, but to weaken the contractile force of the extreme and minute vessels which the heart fills with blood at each of its strokes. These bodies produce, in fact, a paralysis of the organic nervous supply of the vessels which constitute the minute vascular structures. The minute vessels when paralysed offer inefficient resistance to the force of the heart, and the pulsating organ thus liberated, like the main-spring of a clock from which the resistance has been removed, quickens in action, dilating the feebly-resistant vessels, and giving evidence really not of increased, but of wasted power.

The phenomena noticed above constitute the first stage of alcoholic action on the body. We may call this the stage of excitement: it corresponds with a similar stage or degree caused by chloroform.

The Second Stage.

If the action of alcohol be carried further, a new set of changes is induced in another part of the nervous system, the cerebro-spinal. Whether this change be due simply to the modification of the circulation in the spinal cord, or to the direct action of the alcohol upon the nervous matter, is not yet known; but the actual change of function is well-marked, and it consists of deficient power of co-ordination of muscular movement. The nervous control of certain of the muscles is lost, and the nervous stimulus is more or less enfeebled. The muscles of the lower lip in the human subject usually fail first of all, then the muscles of the lower limbs, and it is worthy of remark that the extensor muscles give way earlier than the flexors. The muscles themselves, by this time, are also failing in power: they respond more feebly than is natural to the galvanic stimulus: they, too, are coming under the depressing influence of the paralysing agent, their contractile power being everywhere reduced.

These modifications of the animal functions under alcohol mark the second stage of its action. In this stage, in young subjects, there is usually vomiting. Under chloroform there is produced a degree or stage of action holding the same place in the order of phenomena.

The Third Stage. Fall of Animal Temperature.

The influence of the alcohol continued still further, the upper portions of the cerebral mass, or larger brain, become implicated. These are the centres of thought and volition, and as they become unbalanced and thrown into chaos, the mind loses equilibrium, and the rational part of the nature of the man gives way before the emotional, passional, or mere organic centres. The reason now is off duty, or is fooling with duty, and all the mere animal instincts and sentiments are laid atrociously bare. The coward shows up more craven, the braggart more braggart, the bold more bold, the cruel more cruel, the ignorant more ignorant; the untruthful more untruthful, the carnal more carnal. "In vino veritas" expresses faithfully, indeed even to physiological accuracy, a true condition. The emotional faculties are all in wild disorder; foolish sentimentality extending often to tears, grotesque and meaningless laughter, absurd promises and asseverations, inane threats or childish predictions impel the tongue, until at last there is failure of the senses, distortion of the objective realities of life, obscurity, insensibility, sleep, and utter muscular prostration. This constitutes the third stage of alcoholic intoxication. It is equivalent to the stage of insensibility under chloroform when the surgeon performs his painless task.

While these changes in the action of the nervous system are in progress there is a peculiar modification proceeding in respect to the temperature of the body.. In the progress towards intoxication under alcohol, there are, as we have so far seen, three degrees or stages. The first a stage of simple exhilaration, the second of excitement, the third of insensibility. The duration of these stages can be modified in the most remarkable manner by the mode of administration; but they are always present, except in cases where the quantity of alcohol administered is in such excess that life is instantly endangered or destroyed. In the first or exhilarative stage the temperature undergoes an increase; in birds a degree Fahr., in mammals half a degree, and in the confirmed human inebriate a degree and a half. In the second stage the temperature comes back to its natural standard, but soon begins to fall; and during the third degree the decline continues. The third degree fully established, the temperature falls still lower; in birds it comes down five and a half degrees, and in mammals two and a half to three degrees below what is natural.

In this condition the animal temperature often remains until there are signs of recovery, viz., conscious or semi-conscious movements, upon which, after a brief rise, there may be another fall, of two or even three degrees. Usually with this depression of force there is a desire for sleep, and with perfect rest in a warm air there is a return of animal heat. But the return is very slow, the space of time required to bring back the natural heat being from three to four times longer than that which was required to reduce it to the minimum. The chilliness which the man who has indulged too freely in alcohol, feels, as he becomes sober, is subjective evidence of this kind.

These facts respecting fall of temperature of the animal body under alcohol were derived from observations, originally taken by myself, from the inferior animals and man. They have been confirmed by other observations on the human subject. Dr. De Marmon, of King's Bridge, New York, has specially proved the same in some instances of poisoning by whisky in young children. In one of these examples the temperature of the body fell to 94°, in another to 93½° from the natural standard of 98° Fahr.

Through all the three stages of intoxication the decline of animal heat is a steadily progressing phenomenon. It is true that in the first stage the heat of the flushed parts of the body is for a brief time raised, but this is due to a greater peripheral distribution of blood and increased radiation, not to an actual increment of heat within the body. The mass of the body is cooling, in fact, while the surfaces are more briskly radiating, and soon, as the supply of heat-motion fails, there is fall of surface-temperature. The fall becomes more decided from hour to hour up to the occurrence of the fourth and final stage, upon which I have now to treat.

The Fourth Stage.

The fourth stage of alcoholic intoxication is one of collapse of the volitional nervous centres, of the muscular organs under the control of those centres, and of some of the organic or mere animal centres. It is true that while the body lies prostrate under alcohol there may be observed certain curious movements of the limbs, but these are not stimulated from the centres of volition, neither are they reflected motions derived from any external stimulus. They are strange automatic movements, as if in the spinal cord there were still some life, and they continue, irregularly, nearly to the end of the chapter, even when the end is death.

Through the whole of this last stage two centres remain longest true to their duty, the centre that calls into play the respiratory action, and the centre that stimulates the heart. There is then an interval during which there are no movements whatever, save those of the diaphragm and the heart, and when they fail the primary deficiency is in the breathing muscles. The heart continues in motion the longest of all parts.

The leading peculiarity of the action of alcohol is the slowness with which the two centres that supply the heart and the great respiratory muscle are affected. In this lies the comparative safety of alcohol. Acting evenly and slowly, the different systems of organs die after each other, or together, with the exception of those two on which the continuance of mere animal life depends. But for this provision every deeply intoxicated man would inevitably die.

It happens usually, nevertheless, that under favourable circumstances the intoxicated live even through the fourth stage. The temperature of the body may continue to sink one or two degrees lower, but the alcohol diffusing through all the tissues, and escaping by diffusion and elimination, the living centres are slowly relieved, and so there is slow return of power. If death actually occurs, the cause of it is a condensation of fluid on the bronchial surfaces and an arrest of respiration from this mechanical obstruction. The man is literally drowned in his own secretion.

Continued Physiological Changes from Alcohol.

I have pointed out that alcohol, received, for a long period of time, into the body in moderate quantities, produces enfeeblement of the vessels of the minute circulation. Carried beyond this effect and indulged in as a habit, it leads to additional physiological modifications from a new series of physical causes.

When the alcohol is circulating through the blood, in sufficient quantity to induce its second stage or degree of action, and when it circulates, in this manner, habitually, it exerts a peculiar physical effect on the minute or molecular structure of the organs of the body. The blood is influenced; the red corpuscles which float in the blood stream and which are the bearers of the oxygen to the extreme parts, are rendered irregular in form. They shrink and are notched at their margins, or, as is technically said, are crenated; in fact, alcohol, owing to its greed for water, acts upon the blood-corpuscles after the manner of a salt. The same blood shows an excess of fatty globules; it absorbs oxygen with a reduced freedom, and the harmonious combination of its parts being thus disturbed, it builds up an imperfect series of active vital organs and structures. In very extreme cases, owing to the action of the alcohol, the fibrinous or plastic constituent of the blood is separated within the vessels or within the heart, in the coagulated, or, as we now designate it, the pectous or thickened condition of colloidal matter.

In addition to the physical mischiefs inflicted by alcohol upon the blood-corpuscles and upon the colloidal parts of the blood there are other colloidal structures spread out, through the body, which for the same reasons undergo modification from this agent of evil. These structures are known anatomically as the membranes. The membranes are all colloidal textures, and every organ is enveloped in them. The skin is a membranous envelope. Through the whole of the alimentary surface, from the lips downwards, and through the bronchial passages to their minutest ramifications, extends the mucous membrane. The lungs, the heart, the liver, the kidneys, are folded in delicate membranes which we can strip from these parts. If we take a portion of bone we find it easy to tear off from it a strong membranous sheath or covering; if we open and examine a joint we find both the head and the socket of the bone lined with membrane.

The whole of the intestines are enveloped in the fine membrane called the peritoneum. All the muscles are enveloped in membranes, and the fasciculi or bundles and fibres of muscles have their membranous sheathings. The brain and spinal cord are enveloped in three membranes; one nearest to themselves, a pure vascular structure, a network of blood-vessels; another, a thin serous structure; a third, a strong fibrous structure. The eyeball is an instrument made up of colloidal humours and membranes, and of nothing else. To complete the organization, the minute structures of the vital organs are enrolled in membranous matter.

It was held by the old anatomists that this membranous arrangement of the body is mechanical. The parts and organs, according to their view, are supported and held in position by these membranous sheaths and pouches and coverings, and doubtless the office of mechanical support is a portion of their usefulness, for they hold all the structures together in perfect order. But this is only a small part of their duties. The membranes are the filters of the body. In their absence there could be no building of structure, no solidification of tissue, no organic mechanism. Passive themselves, they nevertheless separate all structures into their respective positions and adaptations.

The animal receives from the vegetable world and from the earth the food and drink it requires for its sustenance and motion. It receives colloidal food for its muscles; combustible food for its motion; water for the solution of its various parts; salts for constructive and other physical purposes. These foods have all to be arranged in the body, and they are arranged by means of the membranous envelopes. Through the membranes nothing can pass that is not for the time in a state of aqueous solution like water or soluble salts. Water passes through them, salts in solution pass through them, but the constructive matter of the active parts that is colloidal does not pass; it is retained in them until it is chemically decomposed into the soluble type of matter. When we take for our food a portion of animal fleshy matter, it is first resolved, in digestion, into a soluble fluid before it can be absorbed; in the blood it exists in the fluid colloidal condition; in the solids it is laid down within the membranes, into new structure, and when it has played its part it is digested again, if I may so say, into a crystalloidal soluble substance ready to be carried away and replaced by addition of new matter: finally it is dialysed or passed through the membranes into the blood, and is disposed of in the excretions.

Upon the membranes, in their integrity, all the silent work of the building up of the body depends. If they are rendered too porous, and let out the colloidal fluids of the blood,—the albumen for example,—the body dies; dies as if it were slowly bled to death. If, on the contrary, they become condensed or thickened, or loaded with foreign material, then they fail to allow the natural fluids to pass through them. They fail to dialyse, and the result is, either an accumulation of the fluid in a closed cavity, or a contraction of the substance inclosed within the membrane, or a dryness of membrane in surfaces that ought to be freely lubricated and kept apart. In old age we see the effects of modification of membrane naturally induced; we see the fixed joint, the shrunken and feeble muscle, the dimmed eye, the deaf ear, the enfeebled nervous function.

Upon all these membranous structures alcohol exerts a direct perverting power of action. It produces in them a thickening, a shrinking, and an inactivity that reduces their functional power. That they may work rapidly and equally the membranes require to be at all times properly charged with water. If into contact with them any agent is brought that deprives them of water, then is their work interfered with; they cease to separate the saline constituents correctly, and, if the evil that is thus started be allowed to continue, they contract upon their contained matter, in whatever organ it may be situated, and condense it.

By its effect on these membranous envelopes and coverings alcohol becomes one of the most extreme causes of modification of animal function and one of the greatest sources of structural degeneration.

The perverted condition of the membranous covering of the nerves gives rise to pressure within the sheath of the nerve, and to pain as a consequence. To the pain thus excited the term neuralgia or tic is commonly applied; or if the large nerve running down the thigh be the seat of the pain, "sciatica." Sometimes this pain is developed as a toothache. It is pain in nearly every instance, commencing at some point where a nerve is inclosed in a bony cavity, or where pressure is easily excited, as at the lower jawbone, near the centre of the chin, or at the opening in front of the lower part of the ear, or at the opening over the eye-ball, in the frontal bone.

The long-continued presence of alcohol in contact with the membranes destroys their dialysing property and produces in the end organic changes.

In some instances the membranous investment or expanse is thickened and indurated. In other instances it is deprived of its elasticity. Again it is so modified that saline substances are retained in its structure, by which process calcareous and crystalline deposits are formed.

Such are the stages or degrees of narcotism, and the structural mischiefs from alcohol. We may learn from them one or two useful lessons.

Physiological Deductions.

In the first place we gather from the physiological reading of the action of alcohol that the agent is a narcotic. I have compared it throughout to chloroform, and the comparison is good in all respects save one, viz. that alcohol is less fatal than chloroform as an instant destroyer. It kills certainly in its own way, but its method of killing is slow, indirect, and by disease.

The well-proven fact that alcohol, when it is taken into the body, reduces the animal temperature, is full of the most important suggestions. The fact shows that alcohol does not in any sense act as a supplier of vital heat as is so commonly supposed, and that it does not prevent the loss of heat as those imagine "who take just a drop to keep out the cold." It shows, on the contrary, that cold and alcohol in their effects on the body run closely together, an opinion confirmed by the experience of those who live or travel in cold regions of the earth. The experiences of the Arctic voyagers, of the leaders of the great Napoleonic campaigns in Russia, of the good monks of St. Bernard, all testify that death from cold is accelerated by its ally alcohol. Experiments with alcohol in extreme cold tell the like story, while the chilliness of body which succeeds upon even a moderate excess of alcoholic indulgence leads direct to the same indication of truth.

The conclusive evidence now in our possession that alcohol taken into the animal body sets free the heart, so as to cause the excess of motion of which the record has been given above, is proof that the heart, under the frequent influence of alcohol, must undergo deleterious change of structure. It may, indeed, be admitted in proper fairness, that when the heart is passing through these rapid movements it is working under less pressure than when its movements are slow and natural; and this allowance must needs be made, or the inference would be that the organ ought to stop at once, in function, by the excess of strain put upon it. At the same time the excess of motion is injurious to the heart and to the body at large: it subjects the heart to irregularity of supply of blood, it subjects the body in all its parts to the same injurious influence; it weakens, and, as a necessary sequence, degrades both the heart and the body.

Speaking honestly, I cannot, by any argument yet presented to me, admit the alcohols by any sign that should distinguish them from other chemical substances of the paralysing narcotic class. When it is physiologically understood that what is called stimulation or excitement is, in absolute fact, a relaxation, a partial paralysis, of one of the most important mechanisms in the animal body, the minute, resisting, compensating circulation, we grasp quickly the error in respect to the action of stimulants in which we have been educated, and obtain a clear solution of the well-known experience that all excitement, all passion, leaves, after its departure, lowness of heart, depression of mind, sadness of spirit. We learn, then, in respect to alcohol, that the temporary excitement it produces is at the expense of the animal force, and that the ideas of its being necessary to resort to it, that it may lift up the forces of the animal body into true and firm and even activity, or that it may add something useful to the living tissues, are errors as solemn as they are widely disseminated. In the scientific education of the people no fact is more deserving of special comment than this fact, that excitement is wasted force, the running down of the animal mechanism before it has served out its time of motion.

It will be said that alcohol cheers the weary, and that to take a little wine for the stomach's sake is one of those lessons that comes from the deep recesses of human nature. I am not so obstinate as to deny this argument. There are times in the life of man when the heart is oppressed, when the resistance to its motion is excessive, and when blood flows languidly to the centres of life, nervous and muscular. In these moments alcohol cheers. It lets loose the heart from its oppression; it lets flow a brisker current of blood into the failing organs; it aids nutritive changes, and altogether is of temporary service to man. So far alcohol may be good, and if its use could be limited to this one action, this one purpose, it would be amongst the most excellent of the gifts of science to mankind. Unhappily, the border line between this use and the abuse of it, the temptation to extend beyond the use, the habit to apply the use when it is not wanted as readily as when it is wanted, overbalance, in the multitude of men, the temporary value that attaches truly to alcohol as a physiological agent. Hence alcohol becomes a dangerous instrument even in the hands of the strong and wise, a murderous instrument in the hands of the foolish and weak. Used too frequently, used too excessively, this agent, which in moderation cheers the failing body, relaxes its vessels too extremely; spoils vital organs; makes the course of the circulation slow, imperfect, irregular; suggests the call for more stimulation; tempts to renewal of the evil, and ruins the mechanism of the healthy animal before its hour for ruin, by natural decay, should be at all near.

It is assumed by most persons that alcohol gives strength, and we hear feeble persons saying daily that they are being "kept up by stimulants." This means actually that they are being kept down; but the sensation they derive from the immediate action of the stimulant deceives them and leads them to attribute passing good to what, in the large majority of cases, is persistent evil. The evidence is all-perfect that alcohol gives no potential power to brain or muscle. During the first stage of its action it may enable a wearied or a feeble organism to do brisk work for a short time; it may make the mind briefly brilliant; it may excite muscle to quick action, but it does nothing substantially, and fills up nothing it has destroyed, as it leads to destruction. A fire makes a brilliant sight, but leaves a desolation. It is the same with alcohol.

On the muscular force the very slightest excess of alcoholic influence is injurious. I find by measuring the power of muscle for contraction in the natural state and under alcohol, that so soon as there is a distinct indication of muscular disturbance there is also indication of muscular failure, and if I wished, by scientific experiment, to spoil for work the most perfect specimen of a working animal, say a horse, without inflicting mechanical injury, I could choose no better agent for the purpose of the experiment than alcohol. But alas! the readiness with which strong well-built men slip into general paralysis under the continued influence of this false support, attests how unnecessary it would be to subject a lower animal to the experiment. The experiment is a custom, and man is the subject.

The true place of alcohol is clear; it is an agreeable temporary shroud. The savage, with the mansions of his soul unfurnished, buries his restless energy under its shadow. The civilized man, overburdened with mental labour, or with engrossing care, seeks the same shade; but it is shade, after all, in which, in exact proportion as he seeks it, the seeker retires from perfect natural life. To search for force in alcohol is, to my mind, equivalent to the act of seeking for the sun in subterranean gloom until all is night.

It may be urged that men take alcohol, nevertheless, take it freely, and yet live; that the adult Swede drinks his average cup of twenty-five gallons of alcohol per year and remains on the face of the earth. I admit force even in this argument, for I know that under the persistent use of alcohol there is a limited provision for the continuance of life. In the confirmed alcoholic the alcohol is, in a certain sense, so disposed of that it fits, as it were, the body for a long season, nay, becomes part of it; and yet it is silently doing its fatal work. The organs of the body may be slowly brought into a state of adaptation to receive it and to dispose of it. But in that very preparation they are themselves made to undergo physical changes tending to the destruction of their function, to perversion of their structure, and to all those varied modifications of organic parts which the dissector of the human subject so soon learns to recognize,—almost without concern, and certainly without anything more than commonplace curiosity,—as the devastations incident to alcoholic indulgence. To the study of these devastations we may now proceed.

CHAPTER VIII.

PHENOMENA OF DISEASE FROM ALCOHOL. THE FUNCTIONAL TYPE.

THE afflicted from alcohol form great populations, and, under one condition or other of the alcoholic disease, they comprise a fair majority of our community. The phenomena of disease inflicted by the agent are not varied, and are easily learned when they are observed with moderate care and with freedom from prejudice and bias. It is perfectly correct, in a scientific point of view, to classify all the phenomena under the one head of alcoholic disease, with sub-divisions marking off the differing phases or varieties of the malady. I shall consider first what may be called, the functional type of the disease.

The simplest form of the disease is seen in those who have become habituated to the use of alcohol up to the first degree. In this degree the alcohol, when in action, is producing arterial relaxation, and the extreme or peripheral circulation is surcharged with blood. Persons who are thus far habituated to it find in the agent what seems to them to be a daily necessity. They rise in the morning imperfectly refreshed by sleep, and they discover in the first meal of the day, in the ordinary breakfast of domestic life, a very imperfect sustainment. As the day advances some want is felt, generally; the stomach seems to require a fillip, the nervous system is languid, the mind is dull, and the muscles are easily wearied. There is, in addition, a sense of central feebleness, as though the heart were waiting for an expected and necessary support. Under the apparent necessity created by these desires, some alcohol is imbibed, and relief is, for the time, obtained. The relief is speedily determinate, and the power for work or for play is restored. But the effect is of short duration. After a brief period the alcohol is demanded again, either with or without food, and at each meal it is felt to be as essential as the food itself—nay, it is often felt to be so essential that food is as nothing without it. Thus the want is day by day sustained; the heart cannot perform its work when, from the removal of the reducing influence of the alcohol, the tension of the minute arterial vessels becomes natural, and complete organized disorder is established in the functions by which life is manifested and upheld. I am not exaggerating when I say there are hundreds of thousands of persons who are systematically passing through their lives in this mode of abnormal existence.

Presuming that under these conditions no further excess of alcohol is received by the body, and that the second degree of alcoholic excitement is rarely if ever reached, the effects induced are varied by the peculiarities of the individual. In certain instances the secreting power of the individual is so active, and he is able to eliminate the spirit with such readiness, that the injurious action it would otherwise speedily excite is long delayed. In such cases we say that the person exhibits a tolerance for the alcohol; and now and then this tolerance is so effective, that until the close of a long life it prevents the outbreak of structural disease. But these examples, when they happen, are very marked exceptions to a general rule.

As a rule, the effect of the continued use of alcohol carried to the degree under consideration, is to create a series of functional, and afterwards of organic changes which end in the establishment of distinct and irrevocable phenomena of disease.

While the body is in its early stages of growth and development, that is to say, up to the thirtieth year, the influence of the depressing agent is mainly on the functional activity; when the growth is perfected, and the organs are settling down to their fixed and steady work, without further chance of increase of size or of functional power, then the organic modifications commence, and, however slowly, they continue in progressive course.

Alcoholic Dyspepsia.

The first symptoms indicating the evil influence of alcohol are, as I have said, functional, and I may add, fluctuating. They are at first commonly called dyspeptic symptoms. The stomach and alimentary canal are surcharged with gases, and flatulency is a constant source of annoyance. With this there is frequent depression of mind, and ready irritation. The emotional centres are easily excited, and to laugh or to cry seems often to be but the work of a thought in act, and of a moment in time. The action of the bowels is irregular: at one time there is a constipated, at another time a relaxed condition. The function of the kidney is equally disturbed; one day the secretion from the kidney is copious and pale, another day it is scanty and loaded with a pink dense deposit, and perhaps at the same time is coated with a fine fatty-like and iridescent film or pellicle. The sleep is irregular: it may be overpowering in the day-time, and absent at night: it may be overpowering during the day, and also too heavy at night. Or the reverse may obtain: sleep may be deficient, the sufferer being kept awake during the night by unnecessary irritation and ferment of the mind.

Sensory Disturbançe from Alcohol.

In the earlier days of its use the functional disturbances from alcohol may not exceed those above named. Later on others are added. A common disturbance is of a sensory kind : a sensitive consciousness of hearing sounds or murmurs within the body. Noises and ringing and buzzing sounds are heard in the head, now suddenly and for brief periods, again for longer or even very long periods of time. The cause of these sounds is simple enough. The arterial tension being reduced, the blood flowing through the internal carotid arteries into the skull, through the bony channel called the carotid canal, presses on the walls of the relaxed vessel, and the vessel, dilated under the pressure of the blood, conveys vibration, from the motion of the blood, to the walls of the bony canal. The vibration is communicated direct to the immediately contiguous auditory apparatus, and thus every movement of the blood becomes a murmur or sound, varied in intensity and quality by the varying tension of the artery. I have known such complete and prolonged relaxation of the arterial vessel that for many months together one continuous murmur, compared to the sound of a torrent of water, or the grinding of a mill, or the whistle of a steam-engine, has been a subjective symptom of the most distressing character. Another not uncommon symptom of a sensory kind is sometimes presented during this form of alcoholic disease; namely, the appearance before the eyes of specks and spots, known by the learned as *muscæ volitantes.* These spots, which are observed as if projected from the eye in space, are most readily perceived in the broad daylight. They appear in two forms at least; as small, round, clear, semi-transparent discs, like the red corpuscles of the blood as they are seen under the microscope; or as dark spots or weblike prolongations. The first of these appearances are, I may almost say, natural, since they may appear, I believe, to persons who are under no abnormal influence: the second are of greater consequence, and are very characteristic of vascular relaxation from alcohol.

Vascular Changes in the Skin.

The external surface of the body during this stage of alcoholic disease is easily affected and disordered. The vessels of the skin are markedly relaxed when the influence of the alcohol is re-excited by a renewed dose; the face and ears redden, and the whole of the cutaneous surface seems in a glow. At first the vessels regain their calibre when the alcohol ceases to exert an influence on them; but by and by, under the frequent repetition of the relaxation, the vessels begin to retain the unnatural change to which they have been subjected, and in the extreme parts, such as the cheek and the nose, they assume a distinctive appearance of confirmed vascular relaxation. For the same reason, —deficient tonicity of the vessels,—the cutaneous secretion is irregular; a small amount of exertion creates a too free perspiration; a little excess of covering to the body has the same effect. The perspiration is profuse, and, condensing quickly on the skin, as water, instead of going off in vapour with a warm glow, is clammy, heavy, and most oppressive. At times the secretion from the skin is extremely acid.

During this state eruptions on the skin are not unfrequent. An eczematous eruption occurring in some extreme parts, as the toes, and consisting at first of a slight vesicular rash, with a thin fluid discharge, and afterwards with a scale which is cast off with much irritation, is one of the most common series of signs of the reduced nervous control over vascular supply induced by alcohol.

Alcoholic Thirst.

To these symptoms, whichever of them be present, there is added one which is never absent altogether; I mean an undue thirst. The real amount of liquid required per day by man, under ordinary circumstances, does not exceed a pint, because every portion of what seems to be solid food supplies water. But when alcohol is introduced, the natural demand is increased at every turn. The alcohol while in the tissues, itself demands water, owing to its great affinity for that fluid; and to gratify this demand, the simple necessary pint is increased to many pints a day, by different fluids drunken at different meals and between meals. Thus I have known a temperate man take a pint of tea or coffee, at breakfast; a pint of ale between breakfast and luncheon; a couple of glasses of sherry with half a pint of water at luncheon; an intermediate glass of ale or cup of tea between luncheon and dinner; two pints of mixed drinks, in form of ale, wine, or water, at dinner; a half pint of tea or coffee after dinner; and a final draught of spirit and water, or wine and water, or seltzer, amounting to yet another half-pint, before going to bed.

In this instance the body has been receiving fluids to the extent of at least six pints per day, or five times beyond what it really required. Naturally, a body thus treated deteriorates. Naturally, it becomes gross from the quantity of unused water laid up in its tissues; naturally, its secreting organs become overtaxed; naturally, its stomach becomes distended with fluids and gases, its muscles relaxed, its heart and its mechanism of respiration enfeebled. Most naturally, its nervous system becomes deficient in activity and power.

Symptoms of Systemic Failure.

The temperate alcoholic, suffering a deterioration of organic structure which he himself does not, perchance, recognize, but which is always present in him, in some form or degree, feels, as his years advance, other phenomena of disease. He detects too acutely changes of season. The summer is more than genial to him, it is life-giving; the autumn is dreary, the winter depressing, and the first months of spring, with their keen easterly winds, are almost destructive. Neuralgic, rheumatic, or gouty pains, varied according to the diathesis of the man, tease or torment; and at last, long before the natural period for cessation from active work has arrived, the man is an old man. His relaxed vessels are ready to give way under light pressure, and his life is ready to depart under natural shocks which to a man of healthy structure would be but as passing vibrations resisted by the force within the body and neutralized. If a man so circumstanced commenced his alcoholic life at his twenty-first year and lived under it to his sixtieth, his heart during that time will have performed an excess of work from an unnecessary cause, equal, at least, in value to the natural term of three years, to say nothing of the change of physical structure it shall have undergone from the perverted nutrition to which it has been subjected.

Those who suffer as above described form a large population of, so-called, temperate persons; there is another and also large population of sufferers from alcohol, in whom, owing to the greater excess in which the members of it indulge, the organic mischiefs are much more intensified and special. In these persons the alcohol has produced true organic disease, the effect of which is shown in the primary failure of some one important organ,—the heart, the lung, the liver, the kidney, the brain.

The victims of the intemperate type of alcoholic disease are truly intemperate, but they are not of necessity drunkards in the usual sense of that term. They may be so, and they often are, but they need never have been intoxicated to insensibility in the whole course of their lives. Some of them are called simply "hard drinkers," others "sots," and others "drunkards"; and they all partake freely of alcoholic drinks, at every available time and season. Ordinarily they cannot live in comfort without a certain daily excess of alcohol, which excess must needs be increased on emergencies: if there be stress of work to perform, a reduction of the hours of sleep, or an addition of what is called "life." As a general fact, the appearance which these persons present is typical of their condition. They are relaxed in fibre, are plethoric, and their face, like the naked legs of Father Lenæus fresh from the new wine, is often of ruddy purple, which colour intensifies as the day advances, and is very readily intensified when the air is cold. Physically these persons are weak; mentally they are undecided and cowardly; they are irritable at all times; some of them suffer paroxysms of rage and storm which subside into contrition, apology, and shame.

In this stage of alcoholic disease the evidences of impaired health are obvious even to the common observer. To the physician the impairment is told, with precision, by many definite symptoms. There is the symptom of which the wisest of men spoke; the story of wounds without cause; the contention, the woe, the sorrow. There is the redness of the eyes. There is, moreover, the tremulous muscle, the soft, feeble pulse, the cold clammy skin, the white-coated tongue, the husky and injected throat, the labouring or irregular breathing, the powerless heart. Not unfrequently these symptoms are all present in the same person, or some of them are present at one period and some at another. The alcoholic constitution of body is, in fact, established; upon which special organic diseases are engrafted with facility.

CHAPTER IX.

ORGANIC DISEASE FROM ALCOHOL.

Disease of the Heart.

DISEASE of the heart is a common organic malady incident to the alcoholic constitution of body. The form of disease is usually either a degeneration of the muscular fibre,—an interposition within the fibre of fatty substance, by which the true muscular elements are partially replaced,—or a degeneration produced from excess of fluid between the muscular elements.

In these states the power of the heart to propel the blood is enfeebled, and although for a much longer time than might be expected the heart responds to the agent that is destroying it and continues to beat more freely when the extreme vessels are paralysed and the arterial recoil is weakened, a time at last comes when the very absence of the recoil is the forerunner of death. For it is by the recoil of the great arteries that the heart itself is fed with the sustaining blood. When, therefore, this backstroke of the circulation is greatly weakened, and the flow of arterial blood through the heart is reduced, then the nutrition of the pulsating organ is impeded, and the once stimulant failing to stimulate, becomes even a depressant. It is a constant complaint of the afflicted in this condition that "nothing does them good now," by which they mean that the stimulant, once so effective, temporarily, is at last a failure.

Life is rarely prolonged many months when alcoholic disease seizes, to this extent, on the heart. The heart is not alone in its disease; the other visceral organs are also deteriorated, and at any moment the balance of life over death, a balance at the best of times finely set, is broken in favour of death. A mental shock, a mechanical injury, an exposure to cold, a strain, a deprivation of food beyond the usual time of taking food;—any of these causes, and others similar, are sufficient to complete an organic wreck which, left to its own fate, would soon break up, from progressive internal failure of vital power.

Disease of the Blood-Vessels.

Disease of the blood-vessels is another phase of the organic disease from alcohol. This change, also a deterioration of structure, may precede the changes in the heart, or may run with them.

In men whose hearts are primitively strong, the vascular form of disease is often the first, and is the cause of death while the heart remains comparatively sound. The deterioration is, as a rule, in the arterial vessels, and may occur in them, either in their wider courses or in their minute or peripheral course. In the larger arteries, the change induced in the coats of the vessel may be a deposit, calcareous or bony-like, a thinning, a dilatation, or an atheromatous or fatty transformation of tissue. Whichever of these changes occurs, the result is that the vessel is weakened at the part, and the elastic coat of the vessel, upon the recoil of which so much depends, is rendered helpless. The arch of the great aorta, the basilar artery of the brain, the arteries of the heart itself, are parts of the arterial circuit very subject to this modification of structure from alcohol. Sometimes the diseased vessel becomes plugged with coagulated blood, and through it, then, no more blood can flow; sometimes, under a little undue pressure, the vessel gives way, and the escape of blood, through the rupture, leads to rapid dissolution.

In the minute vessels, I mean the vessels that lie intermediate between the arterial trunks and the returning veins, the changes produced are infinitely refined and subtle. It is probable that all the structural organic deteriorations from alcohol commence in this minute circulation, in which the processes of nutrition are, during health, in active progress. So soon, in fact, as we begin to make an effort to trace the course of the modifications of disease in these extreme vessels, we enter on the study of disease of the organs through which the vessels are distributed and to the maintenance of which they and the fluids they convey so intimately minister. I shall be incidentally introducing a reference to these changes in all the sections of this chapter that are immediately to follow.

Disease of the Lungs from Alcohol. Alcoholic Phthisis.

A form of pulmonary consumption is induced by alcohol. This disease, which was first defined and described by myself in the year 1864 under the name of alcoholic phthisis, or the consumption of drunkards, is specifically alcoholic in its nature, and holds a fair numerical position in the history of consumption. In an analysis of two thousand cases of phthisis pulmonalis, which came under my own medical observation and care, I found that thirty-six persons, or nearly two per cent., were afflicted with the disease under the pure alcoholic type.

The sufferers from alcoholic phthisis are usually somewhat advanced in life. The youngest

I have met with was thirty-eight, and the average age has been forty-eight years. They are often considered healthy persons until they are stricken with the particular affection, and the figure and conformation of their bodies is good. They are not of the class of drinkers who sleep long, take little exercise, and grow dull, pale, and pasty-looking, but are those who take moderate or short hours of rest, go on actively through their duties, and, primed by frequent resort to the spirit cup, live as much, work as much, see as much, and enjoy as much as they can. They are rarely intoxicated, but constantly are "mellow." Beer and thin wines are to them as water; they can take strong wine *ad libitum*, and even under strong spirit are less influenced than other men, unless,—to use the pitiful jest in which they indulge,—they "pile on the agony."

For many years these sufferers, owing to a splendid conformation of body, may live apparently uninfluenced by any disease, in which respect they differ from alcoholics generally, and in fact are instanced by the votaries of Bacchus as men who drink deep and seem never the worse for the drinking. Fifteen of my patients of this class told me they had never had a day of real illness in their lives; but others had suffered from rheumatism or gout.

This wonderful health is, however, after all, apparent only. Questioned closely, it is soon discovered that the victims have long been out of health; that a slight influence, such as a cold, has easily depressed them; that subjected to unusual excitement or unusual fatigue, their balance of strength against exertion is weakened, and that an extra quantity of alcohol has often been wanted to bring them up to their required activity. Nevertheless, they pass for healthy men; they look healthy, and they retain their good looks to the last. The blotched skin, the purple-red nose, the dull protruding eye, the vacant stare, the alcoholic face of the complete sot, is not traceable in them; neither is the wan, pale, sunken cheek of the ordinary consumptive observable. The face, in short, is the best part of these subjects of alcoholic phthisis. When they are fatally stricken, often when their muscles have lost their power, and the clothes hang like sacks on the emaciated body, their countenance is still ruddy, and the expression firm; so that friends, too ready to be hopefully deceived, believe in recovery when every chance of it has passed away. In some instances death is so quick from this disease, that the body generally in not greatly emaciated, but, like the face, conveys the deception of strength; and, as a rule, those profuse and lowering perspirations which accompany ordinary consumption are not now a part of the phenomena.

The phenomena are not always developed at a time when the sufferer from them is indulging most freely in alcohol. On the contrary, it is by no means uncommon that the habit of excessive indulgence has been stopped for some time previous to the development of acute symptoms. The reasons assigned by the patients for this abstinence vary. One man may have been strongly advised by his friends to abstain, or may himself have undergone a certain measure of reform; another has been led by the reading or hearing of arguments on temperance; a third, by want of means to obtain the indulgence; but by far the larger number affirm that a time came when the desire for so much drink did not occur to them. They will state that they tried the round of the various spirits, but found that none agreed with them as before, so that at last they were driven to rely on beer as the only drink they cared for. We read the meaning of all this clearly enough from a physiological point of view. We read that the body has been resisting the alcohol; that it could not do away with it as it did when all the excreting organs were in their full prime, and that those drinks only can be borne in which the amount of alcohol is least. But the sufferer does not comprehend the fact, and therefore he not unfrequently concludes that his increasing languor and debility are due to the necessary withdrawal of the stimulus on which he seems to have been actually depending during the greater part of his life.

The signs which first indicate failure of health are usually those of acute pleurisy. There is pain in the side, quick, sharp, startling. The term "stitch" in the side is commonly applied to this pain, and is expressive enough. After a time the pain becomes continuous, and when it subsides, suppressed breathing, or difficulty of filling the chest, is at once felt and recognized. This difficulty is due to the circumstance that a portion of lung has become adherent to the inner surface of the chest. The next sign indicating that the disease,—consumption,—is present, is, usually, vomiting of blood. In two-thirds of the examples to which my attention has been directed, this has been the sign that has first caused serious alarm. It is commonly on this event that the physician is called in, who examines the chest with a stethoscope to find a condition that is hopeless. From the date of the occurrence of hæmorrhage, all is down, down towards the grave.

There is no form of consumption so fatal as that from alcohol. Medicines affect the disease but little, the most judicious diet fails, and change of air accomplishes but slight real good. The man suffering this form of consumption may linger

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longer on the highway to dissolution than the victims of other forms of the disease; but there is this difference between them, that the others may leave the highway to find a by-path to comparative health, while he never leaves it, but struggles straight on to the end. In plain terms, there is no remedy whatever for alcoholic phthisis. It may be delayed in its course, but it is never stopped; and not unfrequently, instead of being delayed, it runs on to a fatal termination more rapidly than is common in any other type of the disorder.

Disease of the Liver from Alcohol. Diabetes.

The organ of the body which most frequently perhaps undergoes structural changes from alcohol is the *liver*. The capacity of this organ for holding active substances in its cellular parts is one of its marked physiological distinctions. In instances of poisoning by arsenic, antimony, strychnine, and other poisonous compounds, we find, in conducting our analyses, the liver to be as it were the central depôt of the foreign matter. It is, practically, the same in poisoning with alcohol. The liver of the confirmed alcoholic is probably never free from the influence of the poison; it is too often saturated with it.

The effect of the alcohol upon the liver is through the minute membranous or capsular structure of the organ, upon which it acts to prevent the proper dialysis and free secretion. The organ at first becomes large from the distention of its vessels, the surcharge of fluid matter, and the thickening of tissue. After a time there follow contraction of membrane and slow shrinking of the whole mass of the organ in its cellular parts. Then the shrunken, hardened, roughened mass is said to be "hob-nailed," a common but expressive term. By the time this change occurs, the body of him in whom it is developed is usually dropsical in its lower parts, owing to the obstruction offered to the returning blood by the veins, and death is certain.

Now and then, in the progress to this extreme change and deterioration of tissue, there are intermediate changes. From the blood, rendered præternaturally fluid by the alcohol, there may transude, through the investing membrane, plastic matter which may remain, interfering with natural function, if not creating active mischief. Again, under an increase of fatty substance in the body, the structure of the liver may be charged with fatty cells, and undergo what is technically designated fatty degeneration. I touch with the lightest hand upon these deteriorations, and I omit many others. My object is gained if I but impress the mind of the reader with the serious nature of the changes that, in this one organ alone, follow an excessive use of alcohol.

In the course of the early stages of deterioration of structure of the liver from the organic changes named, another disease, leading speedily to a fatal termination, is sometimes induced. This new malady is called diabetes, and consists in the formation, in enormous quantity, within the body, of glucose or grape sugar, which substance has to be eliminated by dialysis through the kidneys,—a fatal elimination. The injury causing this disease through the action of alcohol may possibly be traced back to an influence upon the nervous matter; but the appearance of the phenomenon is coincident with the derangement of the liver, and I therefore refer to it in this place.

Disease of the Kidney from Alcohol. Calculus.

The *kidney*, in like manner with the liver, suffers deterioration of structure from the continued influence of alcoholic spirit. Its minute structure undergoes fatty modifications; its vessels lose their due elasticity and power of contraction; or its membranes permit to pass through them that colloidal part of the blood which is known as albumen. This condition reached, the body loses in power as if it were being gradually drained even of its blood. For the colloidal albumen is the primitively dissolved fluid out of which all the other tissues are by dialytical processes to be elaborated. In its natural destination it has to pass into and constitute every colloidal part.

These deteriorations of structure in the kidney from alcohol give rise to those varied conditions of disease known by the public under the general name of "Bright's disease." The same morbid states of the kidney may, truly, be induced by other causes than alcohol: by some of the epidemic maladies, as scarlet fever, small pox, and possibly typhoid. But my experience is to the effect that seven out of every eight instances of kidney disease are attributable to alcohol.

Another disease connected with a modified condition of the secretion of the kidney is intimately related to excessive use of alcoholic drinks. I refer to the disease called calculus, or stone in the bladder. Excessive indulgence in *malt* liquors is, I believe, a common cause of this disease. No one who indulges, even temporarily, in alcohol can fail to observe how soon the indulgence gives rise to an unnatural renal secretion, to a fine deposit of pinkish sedimentary matter, and to the occasional production of a fine film of fatty or iridescent substance on the surface of the fluid after it has stood for a short period. This is a condition of the secretion favourable to calculus;

and whenever it is present the prudent man, who knows he is suffering from it, will largely, or altogether, debar himself of the pleasure of his enemy.

Disease of the Eye from Alcohol. Cataract.

In the eyeball certain colloidal changes take place from the influence of alcohol, the extent of which have as yet been hardly thought of, certainly not in any degree studied, as in future they will be. We have learned of late years that the colloidal lens, the great refracting medium of the eyeball, may, like other colloids, be rendered dense and opaque by processes which disturb the relationship of the colloidal substance and its water. By such process of disturbance the lens of the living eye can be rendered opaque, and the disease called cataract can be artificially produced. Sugar, and many salts in excess in the blood, will lead to this perversion of structure, and in course of time alcohol, acting after the manner of a salt, is capable, in excess, of causing the modification. In the eyeball, moreover, alcohol injures the delicate nervous surface upon which the image of all objects we look at is first impressed. It interferes with the vascular supply of this surface, and it leads to changes of structure which are indirectly destructive to the perfect sense of sight.

The degree to which alcohol directly modifies the delicate colloidal mechanism of the organ of vision, can only be appreciated by observation, in a series of researches such as have been carried out, first by Dr. Weir Mitchell of Philadelphia, and afterwards by myself, on the synthesis of cataract. These direct effects of the spirit are, however, probably minor when compared with those that are indirect and are felt through its influence on the blood and the nervous organization. But the field of knowledge on these points is, as yet, too refined and theoretical to be surveyed in this volume.

Alcoholic Insomnia or Sleeplessness.

A perverted state of the vessels of the brain and an unnatural tension to which they are subjected from the stroke of the heart that is under the influence of alcohol, sets up one telling and most serious phenomenon, I mean *insomnia*, inability to partake of natural sleep. There is a theory held by some physiologists that sleep is induced by the natural contraction of the minute blood-vessels of the brain, and by extrusion, through that contraction, of blood from the brain. I am myself inclined, for reasons I need not wait to specify now, to consider this theory incorrect; but it is nevertheless true that during natural sleep the brain is receiving a reduced supply of blood; that when the vessels are filled with blood, without extreme distention, the brain remains awake, and that when the vessels are engorged and over-distended, there is induced an insensibility which is not natural sleep, but which partakes of the character of apoplexy. This sleep is attended with long and embarrassed breathings, blowing expirations, deep snoring inspirations, and uneasy movements of the body, with even convulsive motions. From such sleep the apparent sleeper wakes unrefreshed, and unready for the labours of the day.

The effect of alcohol on the brain is to produce and maintain the relaxation of its vessels, to keep them charged with blood, and so to hold back the natural repose. Under this divergence from the natural life, the sleepless man lies struggling with unruly and unconnected trains of thought. He tries to force sleep by suppressing, with a great effort, all thought, but in an instant wakes again. At last the more he tries the less he succeeds, until the morning dawns. By that long time, the spirit that kept his cerebral vessels disabled and his heart in wild unrest having become eliminated, he is set free, and the coveted sleep follows. Or perhaps, wearied of waiting for the normal results, he rises, and with an additional dose of the great disturber, or with some other tempting narcotic drug of kindred nature, such as chloral, he so intensifies the vascular paralysis as to plunge himself into the oblivion of congestion, with those attendant apoplectic phenomena, which he himself hears not, but which, to those who do hear, are alarming in what they forebode, when their full meaning is appreciated. Connected with this sleep there is engendered in some persons a series of convulsive movements, which all the skill of physic is hopeless to cure, until the cause is revealed and removed.

Nervous Diseases from Alcohol.

The brain and spinal cord, and all the nervous matter, like other parts become subject, under the influence of alcohol, to organic deterioration. The membranes enveloping the nervous substance undergo thickening; the blood-vessels are subjected to change of structure by which their resistance and resilience are impaired; and the true nervous matter is sometimes modified, by softening or shrinking of its texture, by degeneration of its cellular structure, or by interposition of fatty particles.

These deteriorations of cerebral and spinal matter give rise to a series of derangements, which show themselves in the worst forms of nervous disease.

But not a single serious nervous lesion from alcohol appears without its warning. As a man who, when drinking at the table, is warned by certain unmistakable indications, that the wine is beginning to take decisive effect on his power of expression and motion, so the slow alcoholic is duly apprised that he is in danger of a more permanent derangement. He is occasionally conscious of a failing power of speech, and in writing or speaking he loses common words. He is aware that after fatigue his limbs are unnaturally weary and heavy, and he is specially conscious that a sudden fall of temperature lowers, too readily, his vital energies.

The worst sign of impending nervous change is muscular instability, irrespective of the will; that is to say, an involuntary muscular movement whenever the will is off guard. This is occasionally evidenced by sudden muscular starts which pass almost like electrical shocks through the whole of the body; but it is more frequently and determinately shown in persistent muscular movements and starts at the time of going to sleep. The volition then is resigned to the overpowering slumber, and properly all muscular movement, except the movement of the heart and of the breathing, should rest with the will. But now this beautiful order is disturbed. In the motor centres of the nervous organization the foreign agent is creating disturbance of function. The fact is communicated to the muscles by the nervous fibres, and the active involuntary start of the lower limbs rouses the sleeper in alarm. Ignorant of the import of these messages of danger, the habituated alcoholic continues too frequently his way, until he finds the agitated limbs unsteady, wanting in power of co-ordinated movement, and useless.

Two forms of nervous disease may ensue from this action of alcohol on the nervous organization. The first of these is alcoholic epilepsy, the second alcoholic paralysis.

Epilepsy from Alcohol.

This epilepsy is essentially characteristic and is in fact but an extension of that spasmodic start of limb to which reference is made above. The seizure usually occurs at first in the night and during sleep, and may not be distinguished by the sufferer himself from one of many old attacks of what he probably calls "nightmare." In time his friends become acquainted with the fact of the seizure or some evidence is left of it in form of bruise or bitten tongue. Still later the attack occurs in the daytime and then the precise nature of the disease is declared. In its early stages alcoholic epilepsy is comparatively easy of cure.

It is cured sometimes spontaneously by simple total abstinence from alcohol. In its later stages it is, however, as incurable as any other type of this serious and intractable malady.

Paralysis from Alcohol.

Alcoholic paralysis develops itself in two forms of paralytic disease. It is in some instances local, affecting one limb or one side of the body, and leaving the will and the memory entire, or at most but slightly enfeebled. It is a paralysis that in a chronic manner runs counterpart with that deficient power of co-ordination of the muscular movements which marks the passage from the second to the third degree of acute intoxication. It comes on steadily, gradually, and for a long period seems, to the victim of it, to be temporarily relieved by the use of the agent that produces it. At last it is complete, and as a rule, to which rule nevertheless there are happily many exceptions, it is irrecoverable. The exceptions to the rule would, no doubt, be much more numerous if the injunction of the physician "to abstain absolutely," were not only duly enforced and solemnly promised, but faithfully carried out.

The second form of alcoholic paralysis is general in its development and accomplishment, It commences commonly after a long stage of muscular feebleness, persistent dyspepsia, persistent fœtor of the breath and many other warnings, with thickness of the speech and general failure of muscular power. To these symptoms succeeds that alienation from the natural mental state, known as loss of memory. This extends even to forgetfulness of the commonest of things; to names of familiar persons, to dates, to duties of daily life. Strangely too this failure, like that which indicates, in the aged, the era of second childishness and mere oblivion, does not at first extend to the things of the past, but is confined to events that are passing. On old memories the mind, for a limited time, retains its power; on new ones it requires constant prompting and sustainment.

If this failure of mental power progress, it is followed with further loss of volitional power. The muscles remain ready to act, but the mind is incapable of stirring them into action. The speech fails at first, not because the mechanism of speech is deficient, but because the cerebral power is insufficient to call it forth. The man is reduced to the condition of the dumb animal. Aristotle says, grandly, animals have a voice; man speaks. In this case the voice remains, the speech is lost. The man sinks to the level of the lower spheres of that living creation over which he was born to live and rule.

The failure of speech indicates the descent still deeper to a condition of general paralysis in which all the higher faculties of mind and will are powerless, and in which nothing remains to show the continuance of life except the parts that remain under the dominion of the chain of organic or vegetative nervous matter. Our asylums for the insane are charged with specimens of humanity thus helplessly afflicted. The membranes of the nervous centres of thought have lost, in these, the dialysing function. In some instances, though less frequently than might be supposed, the nervous matter itself is modified visibly in texture. The result is the complete wreck of the nervous organization, the utter helplessness of the will, the absolute dependence upon other hands for the very food that has to be carried to the mouth.

The picture is one of breathing death; of final and perpetual dead intoxication.

Mental Alienations from Alcohol. Dypsomania—Mania a potu.

Connected, or it may be disconnected, with some of the physical kinds of diseases from alcohol already set forth, are other morbid states more purely mental in their representation. The first is that craving for incessant supply of alcohol to which we give the name of *dypsomania*. In those who are affected with this form of alcoholic disease, a mixed madness and sanity is established, in which the cunning of the mind alone lives actively, with the vices that ally themselves to it. The arrest of nervous function is partial, and does not extend to the motor centres so determinately as to those of the higher reasoning faculties. But the end, though it may be slow, is certain. And the end is, as a rule, that general paralysis which I have just described. The dypsomaniac is, however, capable of recovery, within certain limits, on one and only one condition, that the cause of his disease be totally withheld.

The effect of alcohol on the mental functions is shown in yet another picture of modern humanity writhing under its use. I mean in the form of what may be called intermittent indulgence to dangerous excess. This form of disease has been named the *mania a potu*, and it is one of the most desperate of the alcoholic evils. The victims of this class are not habitual drunkards or topers, but at sudden intervals they madden themselves with the spirit. They repent, reform, get a new lease of life, relapse. In the intervals of repentance they are worn with remorse and regret; in the intervals of madness they are the terrible members of the community. In their furious excitement they spread around their circle the darkness of desolation, fear and despair. Their very footsteps carry dread to those who, most helpless and innocent, are under their fearful control. They strike their dearest friends; they strike themselves. Retaining sufficient nervous power to wield their limbs, yet not sufficient to guide their reason, they become the dangerous living plagues of society, whom our legislators, fearing to touch the cause of their malady, would fain try to cure by scourge and chain.

To the physiologist these "maniacs a potu" are men under the experiment of alcohol, with certain of their brain centres paralysed, and with a broken balance, therefore, of brain power. To him the remedy for such aberration is not to whip the maniac back to the drink, but to take the drink from the maniac.

Delirium Tremens.

The nervous disease induced by alcohol, to which the term of delirium tremens is commonly applied, is defined with remarkable accuracy by its name. The delirium is of the most extreme kind, now violent, passionate, ecstatic, again low wandering muttering: a delirium in which imaginary fears and conjured-up horrors of the mind are realities to the sufferer. To this degraded mental condition is added the disturbance of the whole muscular system. The muscles have lost their tonic power of contraction, and over them the will has lost its perfect mastery. The enfeebled muscular organs are therefore subjected to uncontrolled nervous shocks, by which they are kept in constant tremor or wave-like motion that is increased by any external irritation. In this stage of alcoholic disease the forces of life are, moreover, so depressed that the animal temperature is down three, and even four degrees below the natural standard. In brief, the whole forces of life have to be expended on the mere organic acts of life, the support of the motions of the heart, the muscles of respiration, and the functions of the secreting glands. The modification of all the tissues is so extreme during this state, it is indeed a simple marvel that recovery should follow, as it does, upon elimination of the poisonous fluid from the body. From my experimental researches I have gathered that delirium tremens is probably not induced by pure ethylic alcohol, but by the heavier alcohols, viz. butylic and amylic, with which our common spirituous drinks are often contaminated.

Hereditary Transmission of Alcoholic Disease.

I should be conscious of having trespassed too long on the attention of the reader in dealing with this single subject of disease of modern life from alcohol, were I not equally conscious that the truth respecting it can never be confirmed enough, and that no subject in our whole national life is worthier our serious thought. One word more, therefore, ere I close the chapter.

The solemnest fact of all bearing upon the physical deteriorations and upon the mental aberrations produced by alcohol is, that the mischiefs inflicted by it on man through his own act and deed cannot fail to be transmitted to those who descend from him, and who are thus irresponsibly afflicted. Amongst the many inscrutable designs of nature none is more manifest than this, that physical vice, like physical feature and physical virtue, descends in line.

But not one of the transmitted wrongs, physical or mental, is more certainly passed on to those yet unborn than the wrongs which are inflicted by alcohol. Many specific diseases engendered by it in the parent are too often stamped in the child; while the propensity to its use descends also, making the evil interest compound in its terrible totality.

CHAPTER X.

ON DISEASE FROM TOBACCO.—PHYSIOLOGICAL PHENOMENA.

THE influence of tobacco on man forms a subject for discussion on which the extremest views prevail. On one side tobacco has been held up as the most harmless of luxuries; a soothing luxury that quiets the irritable nervous organism, relieves weariness and entices repose. On the other side it has been denounced as the originator, not only of mere functional disorder, but of some of the worst forms of organic disease, such as cancer and consumption. I shall strive in dealing with this subject to put forward the actual facts, following as my guide no authority except the natural authority itself, derived from the direct observation of the effects produced by the agent in question upon the animal body.

The smoke of tobacco inhaled by the smoker is, chemically, a rather complex substance. To ascertain what the active parts of it are, I constructed a small pair of bellows which would act like the lungs when a man is smoking a lighted pipe or cigar. Part of the smoke produced by the combustion was allowed to escape from the lighted end of the pipe or cigar in the ordinary way: the remaining part was drawn into the bellows as it would be into the lungs, and thus obtained it was submitted to examination.

To make the examination still more certain, different specimens of tobacco were used and different kinds of pipes were also employed,—the fine porcelain bowl and stem, the small cutty, the long churchwarden, the pure virgin clay, the black odorous "coloured" clay, the meerschaum new and "coloured," and the wooden pipe new and old.

Composition of Tobacco Smoke.

We shall see as we progress that differences prevail in respect to the action of differing kinds of cigars, differing kinds of tobacco, and differing pipes; but it will be well, as a preliminary, to lay before the reader an account of the substances which are common to all varieties of tobacco smoke. For, it is to be observed that such differences as exist are due to quantity rather than to quality, and that in every variety of the smoke there are present certain bodies of which it may be said to be composed.

The result of my inquiries showed that there exists in tobacco smoke the following constituent parts:—*Water* in the state of vapour; free *carbon* diffused in very minute particles, or soot; some *ammonias* existing in a state of vapour, and giving to the smoke an alkaline reaction; *carbonic acid*, and *carbonic oxide*, each in the state of gas; and a product coming over, also in vapour, but easily condensable into an oily-like substance, crude *nicotine*. This nicotine was in turn found to be complex. It yielded a fluid alkaloidal body, *nicotine proper*, a *volatile empyreumatic substance* containing an ammonia, and a dark resinous bitter *extract*.

In the hands of other inquirers these products of the combustion of tobacco have been split up into still more refined divisions. Eulenberg and Vohl passed the smoke of tobacco through a strong solution of potassa, and afterwards through a dilute solution of sulphuric acid. The solution of potassa separated carbonic, acetic, formic, butyric, valeric, and other acids, including even hydrocyanic or prussic acid, together with creosote and some hydrocarbons. The acid solution fixed ammonia, and a series of oily bases belonging to those homologues of aniline which Dr. T. Anderson first discovered in coal tar. These bases run parallel with aniline, and under the action of iodide of ethyl yield ammonium compounds. They are composed of the elements carbon, hydrogen and nitrogen, and they differ in physical, and probably in physiological qualities, according to their atomic weight. The lightest of them is pyridine, composed chemically of C_5H_5N; the heaviest is viridine, $C_{12}H_{19}N$; and intermediate are picoline C_6H_7N, lutidine C_7H_9N, collodine $C_8H_{11}N$, parvoline $C_9H_{13}N$, coridine $C_{10}H_{15}N$, and rubidine $C_{11}H_{17}N$. Pyridine was found to be most abundant in smoke from tobacco, and picoline, lutidine, and collidine in smoke from the cigar.

The various chemical bases here described are obtained from tobacco when the combustion of it is very rapid and perfect. Then the adhesive resinous matter which I described in a preceding paragraph is completely decomposed and resolved into new products. It would, however, be wrong to suppose that in the ordinary process of smoking these products are all formed and inhaled. They are not. In the common combustion of the pipe or cigar the substances I enumerated in the first paragraphs under this head are those that need, chiefly, to be remembered. These I believe are invariably formed, and the effects produced on persons who indulge in smoking are traceable readily to their action.

Effects of the Constituents of Tobacco Smoke on the Body.

The effects produced by the smoke are compound, owing to the different agents present in it, more than one of which must be considered active. The water may be set down as harmless; the free carbon acts mechanically as an irritant, and in confirmed smokers discolours the secretions of the bronchial tubes and even the hard structures of the mouth, such as the teeth. The free ammonia plays a very important part: it is the ammonia that bites the tongue after long smoking; that makes the tongue and throat of the smoker so dry, inducing him to quaff as he smokes, and that excites the salivary glands to secrete so freely. The ammonia also exerts a solvent influence on the blood. The carbonic acid differs so greatly in amount, from various specimens of tobacco, that it is difficult to estimate the extent of its action, but its tendency is to produce sleepiness, headache, and lassitude. The carbonic oxide, like the carbonic acid, varies in amount: if the combustion of the tobacco be slow and incomplete, it is present in small quantities, but if the combustion be rapid it is absent. When present it is a very active, poisonous agent, producing drowsiness, unsteady movements of the heart, tremulous or even convulsive movements of the muscles, and vomiting. The effect of nicotine proper is to produce tremor, palpitation of the heart, and paralysis. The volatile empyreumatic substance causes a sense of oppression and gives an unpleasant odour to the breath; it is in fact this substance which causes the peculiar smell in what is called stale tobacco smoke, and which hangs so long in the breath of the smoker and on articles of his clothing. The bitter extract is the substance which communicates the exceedingly nauseous, sharp taste recognised by every unpractised smoker who takes a foul pipe in his mouth: it excites vomiting in persons unaccustomed to tobacco, but after a time this effect of it ceases. It would lead me into an unnecessary minuteness of detail to indicate further the specific effect on the body of the chemical compounds named above. I therefore proceed to consider briefly the effects of tobacco in its compound form, as they are commonly seen in those who indulge in the habit of smoking.

Primary Action on the Body.

The action of tobacco extends widely through the animal kingdom. We place a few mites from a cheese under the microscope, and direct upon them a current of tobacco smoke from an ordinary pipe. In a few seconds the little animals reel over, become convulsed, and even appear to die; but on them the effect of fresh air is active, and as the poisonous vapours exhale readily from their bodies, they recover. On flies and bees and wasps the same effects may be observed. Cold-blooded animals succumb slowly to the smoke, birds rapidly. On all warm-blooded animals the symptoms it produces are powerfully marked and are the same in character. Some animals, such as the goat, can eat large quantities of tobacco with impunity, but even these animals do not escape from the effects of the fumes.

The symptoms from inhalation show themselves quickly in man. I myself once inhaled the product from one pipe holding sixty grains of tobacco, the said product being diffused through five thousand cubic inches of common air: within four minutes the signs of specific tobacco-poisoning set in, and I was compelled to cease to inhale.

The first impression made by the smoke of tobacco is through the blood, and inasmuch as the whole volume of blood courses through the body in from three to five seconds, the indications of its effects, from the many compounds of which it is composed, are felt universally in the young smoker. After a short time, as the blood becomes charged with the poisons, the organic nervous chain and the organs it supplies are powerfully impressed.

The stomach is the first to give indication of suffering, and an effort is made through that organ to eliminate certain of the offending substances. If the poison cease to be taken in at this point, or if the quantity that has been received be not immoderately large, recovery commences, the surface of the skin resumes its healthy colour and temperature, and after a few hours the ordinary functions of life are once more naturally performed. For, tobacco is not a poison that leaves important disease of any particular organ or class of organs in its track; if it did, that mischief, which would soon have been detected by physicians, would have excluded it long since from the list of luxuries.

If the process of poisoning be continued beyond the point to which we have followed it, the brain and nervous system next become affected; there is now presented an inability to stand steadily, and to make a sure grasp of objects near, the body seems to whirl, and all things around to reel, —effects which are soon followed by involuntary action of the muscles, and by convulsions which are often intensely severe. In extreme cases, this muscular spasm extends to the muscles of the chest and to the heart, and thereupon succeed a deathly faintness and tremor. I once saw a boy who, while "learning to smoke," induced in himself, from the first few pipes, these signs in a degree that was most painful to witness: his heart having nearly ceased to beat, his sensation of impending death was terrible, while through his chest, which was spasmodically fixed, there darted, whenever he attempted to breathe, a pain short and sharp as an electric shock. These spasmodic seizures lasted for many hours.

Pushed to an extremity, the symptoms terminate in death from arrest in the beating of the heart.

The extreme symptoms induced by tobacco smoke are intensely severe, and the idea that tobacco is a narcotic like opium or chloroform is entirely disproved by them. Its action is as an irritant upon the motor parts of the nervous system, not as a narcotic upon the sensational.

It will be asked—what are the conditions of the organs of the body during the time that a person who is learning to smoke is undergoing his penance? As regards the human body, neither I nor any other physician could speak with certainty, for the facts have not been observed; but from analogy derived from the inferior animals, which analogy must be very perfect, the conditions of the vital organs are as follow. The brain is pale and empty of blood; the stomach is reddened in round spots, so raised and pile-like, that they resemble patches of dark Utrecht velvet; the blood is preternaturally fluid; the lungs are pale as the lungs of a calf, when we see them suspended in the shambles; while the heart, overburthened with blood, and having little power left for its forcing action, is scarcely contracting, but is feebly trembling, as if, like a conscious thing, it knew equally its own responsibility and its own weakness. It is not a beating, it is a fluttering heart: its mechanism is perfect, but each fibre of it to its minutest part is impregnated with a substance which holds it in bondage and will not let it go.

Tobacco, then, if it be a friend, is not very friendly at the first introduction; fortunately, or unfortunately, it becomes milder as it grows more familiar.

Secondary Action on the Body.

The body, after being subjected for a few times to the poisons of tobacco smoke, becomes accustomed to their influence, and ceases to offer any of the more serious signs of opposition. There is set up what is technically called "a tolerance," and the direct mischief seems to be over. The "tolerance" thus brought about is not peculiar to tobacco as a poison. There are many other substances which in like manner are tolerated after a time. Antimony, as a ready example, is one of these. In fact, the body adapts itself to many impressions and influences which at first sight are objectionable, by virtue of a limited physical power it possesses of distributing the offending substances and relieving itself of them. This occurs in respect to tobacco. After a short time the products of the tobacco find a ready exit out of the system. They are thrown out by the three great eliminatories—the lungs, the skin, and the kidneys. The volatile matters exhale by the lungs. We have evidence of this in the empyreumatic and ammoniacal breath of every smoker. In confirmed and inveterate smokers, their very garments, after a short wearing, become impregnated with the odour of tobacco, and we say that the smoke hangs about their clothes, as though it had simply fallen on the clothes from without, but the vapour has in truth exhaled from the skin, and saturated the clothing. The clothes of some moderate smokers are also intensely fumigated; so that in whatever company they go, and however they may dress, they bear with them the evidence of their indulgence. A gentleman who was a very moderate smoker once consulted me on this subject, telling me, "If I smoke but a single pipe or cigar I carry it about with me for half a day, whereas my brother smokes a dozen pipes and nobody would suspect half an hour afterwards that he had smoked at all." These observations are commonly made, although the causes of the phenomena are not understood. Nevertheless, they may be understood. When the moderate smoker carries about with him the odour of tobacco he has some defect in his breathing: he cannot eliminate by his lungs with the rapidity he should, so the odours hold to his breath, and the skin doing more work than is natural to it, in order to relieve the lungs, lets products pass off by it also, thereby saturating the clothing with the perfume. Thus one of our old herbal books says of tobacco: "It were a fine cure for asthmatics, did it not render them much more disagreeable to politeness than it doth other men who do attach themselves to it the more."

Every smoker is cognizant of the circumstance that there are times when he himself is more redolent than he ought to be, and of times when his appetite for the weed is reduced to a minimum; and, if he inquire into the cause of this, he discovers it to be due to an arrest in some active secretion. He tells us on such occasions that "his liver is out of order," which is a sufficiently uneducated way of speaking for the physiologist, but which conveys, nevertheless, the idea of a series of perverted functional changes that are now pretty well understood as indicating a suppression of function in the lungs.

We thus account for the removal from the body of the volatile tobacco poisons; but what of the nicotine and the bitter extract? At the temperature of the body, nicotine cannot be considered a volatile substance, and the bitter extract is a soluble solid. Both, I believe, are carried off by the kidney, the grand eliminator of all poisons of the soluble type.

When the facts I have now stated are impressed clearly on the mind, the evils of slow tobacco-poisoning are easily followed. These evils are transitory, and the influences exerted are functional, not organic. In the confirmed smoker there is a constant functional disturbance. His organs are doing work which is not essential to their duties; but they do it with moderate ease, they retain nothing that is detrimental to their structure, and, let alone, they soon regain their natural condition. In the recognition of these simple truths the whole gist of the tobacco controversy is embodied. It is on the presence of the functional disturbance that the vehement opponent of tobacco bases his arguments; it is on the absence of organic mischief that the advocate of tobacco rests his defence.

CHAPTER XI.

PHENOMENA OF DISEASE FROM TOBACCO.

We have to consider, in detail, in this chapter, the functional diseases to which the smoker is subjected as they are presented with more or less of distinctiveness in the blood, in the digestive organs, in the structures of the throat and mouth, in the heart, and in the lungs.

The Blood.

In the blood, the prolonged inhalation of tobacco produces changes very marked in character. The fluid is made thinner than is natural, and, in extreme cases, paler. In such instances the deficient colour of the blood is communicated to the body altogether, rendering the external surface yellowish, white and pasty. The blood being thin exudes so freely that a cut surface bleeds for a long time and may continue to bleed inconveniently, even in opposition to remedies. But the most important change is exerted on those little bodies which float in myriads in the blood, and are known as the red globules. These globules have, naturally, a double concave surface, and at their edges a perfectly smooth outline. They are very soluble in alkalies and are subject to change of shape and character when the quality of the fluid in which they float is modified in respect to density. The absorption, therefore, of the fumes of tobacco, leads to rapid changes in them. Microscopically examined, they are found to have lost their round shape, to have become oval and irregular at their edges and, instead of having a mutual attraction for each other,—a good sign, within certain limits, of their physical health,—they lie loosely scattered. Indeed, they indicate to the learned observer, as clearly as though they spoke to him, that the man from whom they were taken was physically depressed, and deficient both in muscular and mental power.

But with all this, it is marvellous to observe how quickly the blood will regain its natural characteristics on removal of the poison. One day of abstinence is often sufficient to permit the poisons to escape and to restore the fluid to its natural condition.

The facts here narrated are derived from the direct observation of the blood of smokers, and I believe they fairly represent the influence of the smoke of tobacco on the blood. But before

I quit this subject I would point out that the effects produced vary exceedingly, according to the manner in which the tobacco is smoked. If the body is fasting the effects are much more rapidly developed; and this fact is very important, as it accounts for the well-known circumstance that the majority of smokers fail to smoke comfortably on an empty stomach. Again, the effects are brought out with far greater intensity when the smoker indulges in a room the air of which is strongly impregnated with the poisons of tobacco. The reason of this is obvious. Under the circumstances named, the smoker is inhaling over and over again the finely-distributed volatile matters with which the air is charged, while at the same time he is unable to throw off freely the products of his own respiration. Lastly, if a large quantity of fluid be imbibed during prolonged smoking, the changes in the blood are greatly increased, and are made to continue a longer time; for the fluids dilute the blood, and, by dissolving and holding the poisons, render elimination more difficult.

The Digestive Organs.

Although after a time a limited tolerance is set up to the action of tobacco smoke, a certain influence is exerted by it, persistently, on the vital organs of the smoker. On the stomach, tobacco produces, even in the most confirmed smokers, marked deviations from the natural condition. Unconsciously, these smokers lose, to a considerable degree, their natural appetite. They feel, as it is said, that the pipe not only takes away hunger but appears to sustain them in the absence of food. This is not mere fancy, for the smoke reduces the activity of all the organs and, therewith, the organic power. The effects on the stomach are twofold, and arise from two distinct poisons. The stomach is lined with a delicate membrane, called mucous membrane, from which the gastric or digestive secretion is derived, and on the healthy structure of which good digestion depends. Surrounding this mucous membrane the stomach is provided with layers of muscular fibre, which, during the act of digestion, are in rapid motion and bring the food mechanically into contact with the fluid that is to dissolve it. The influence of the smoke extends to both these structures. The bitter extract of which I have already spoken, and which so readily excites vomiting in the young smoker, appears to act at all times, with more or less violence, on the mucous lining. At first it produces great irritation, redness, and injection; after a time the changes are subdued but are not entirely removed. The membrane secretes irregularly, and, as a general rule, does not produce the due amount of gastric fluid; hence digestion is impeded. After digestion an acrid fluid is left in the stomach, which irritates and gives rise to heartburn, eructations, frequent nausea with an almost constant sensation of debility of the stomach, and sometimes to cravings for particular foods, especially for those which have an acid reaction, such as pickles and fresh fruits. The muscular portion of the stomach is acted upon by the nicotine. In small quantities, the nicotine excites a slight movement in the muscular fibres not only of the stomach but of the other parts of the alimentary canal, and in moderate smokers it acts as an aperient. Carried to excess, it produces a palsied condition of the muscular fibres, leading to a great increase of debility in the digestive organs, to a serious impairment of their functions and to constipation.

Like the blood, the digestive organs quickly regain their activity on being relieved from their temporary disturbance; for there is no evidence to support the idea that an actual organic change of structure is produced in them. But inasmuch as they are the organs through which the vegetative life of man is sustained, it must be admitted, that so long as they are functionally disturbed, so long the whole of the body, looking to them as it does for the sources of supply, is held, proportionately, in want and exhaustion.

If, at the same time, waste were not, to a certain extent, prevented, that exhaustion would soon be increased even to danger.

I have already indicated that the bitter extract of tobacco travels along the stem of the pipe, is absorbed directly by the mouth, and is thence carried into the stomach by the act of swallowing. This is also true of nicotine. It is important to bear these facts in mind, as they explain the different degrees of action of different kinds of pipes out of which tobacco is smoked. A long, perfectly clean pipe, composed of a material like clay, which easily absorbs the two bodies specified, may be smoked with partial impunity. It requires a very confirmed smoker to tolerate the black dirty bowl and stem, charged to the very mouthpiece with the poisonous products, and even in him, in proportion as toleration is borne, digestion is sacrificed. Indeed, I do not believe it possible that any man can constantly smoke a foul pipe without being as constantly a martyr to dyspepsia.

Again, owing to the causes I have named, different kinds of tobacco exert different influences on the smoker. Some tobaccoes, such as Cavendish, pigtail, and coarse shag, yield the fluid products in a much greater degree than do Latakia or Turkish. Hence the latter are called mild tobaccoes; and although they produce dryness of the tongue, from the ammonia evolved in their smoke, they do not upset the digestion so materially, nor nauseate so much as the stronger tobaccoes, unless they are indiscriminately used. Cigars, if they are "good," produce dyspepsia very quickly, for in smoking them nicotine is more rapidly absorbed.

The symptoms of indigestion that have been narrated, as occurring from the smoking of tobacco, are met with in those who indulge in snuffing, and often in a marked degree. In the snuff-taker, tobacco, in combination with the fluids of the mouth, finds its way into the stomach directly. The enfeebled condition of the organ of digestion, which thereupon follows, is often exceedingly difficult of cure; it is incurable so long as the habit is sustained, and it even continues for long periods after the habit has been relinquished. The same symptoms follow the practice of chewing tobacco, a practice now happily all but obsolete amongst the better informed members of society.

The Salivary Secretion.

The effects produced by smoking, on the structures of the mouth and throat, have often been discussed with considerable warmth of argument. The facts presented to us, as guides to a correct conclusion, may be simply stated.

It will be remembered that along the edge of each lip there is a point where the common external skin, changing its character, becomes red in appearance, smooth and bright. Let the eye be carried from the cheek to the inner surface of the lips and mouth, and the change is at once detected. The difference of these appearances lies in this, that at the commencement of the lips the ordinary skin of the body is slightly transformed in structure. Here too the skin receives a new anatomical name; it is called *mucous membrane.* The membrane is very much like skin in its anatomical characters, and when washed, so as to be freed from blood, is nearly identical in appearance. It covers the surface of the mouth, and extends through the gullet to the stomach, and so on throughout the whole of the alimentary canal. It may easily be lifted up and removed, or may be torn, abraded or ulcerated. It is well supplied with glands. The ducts or open tubes of those glands which produce the saliva, pass through the mucous membrane into the mouth, while in the back of the mouth and throat there are numerous small glands which constantly supply secretion. At the back of the mouth are the tonsils, and the central structure projecting downwards, called the uvula, and we must not forget in this summary of the parts of the mouth, the gums and the teeth.

What influence has the smoke of tobacco on the structures named above?

There is excited always in the young smoker an over-action of the glands of the mouth, and especially of the salivary glands. This over-action is felt only during the act of smoking, and in certain persons there is very little over-action even then. But in the large majority of smokers there is set up a copious salivation, leading to expectoration. As the saliva is necessary for the process of digestion, it has been supposed that so to divert it is to destroy, to a considerable extent, the power of digestion. The argument might be true if men smoked and ate at the same moment; but as this is impossible, and as, in smokers generally, there is an increased rather than a diminished tendency to action of the salivary glands, it is not very easy to see how any loss of saliva can occur from smoking. On the other side, if men must smoke, they are relieved by expectoration; for if they do not expectorate while smoking, the saliva, some of which is swallowed, is made the vehicle for the conveyance into the stomach of those soluble and pernicious substances, the nicotine and the bitter extract.

An evil of a local kind sometimes occurs from the profuse flow of salivary fluid. The saliva contains, in solution, salts of lime, which, existing in excess, are liable to be deposited so as to form hard stone-like masses in the ducts of the salivary glands, or to be laid down on the teeth in the calcareous layer which constitutes the crust called tartar. I have seen these results follow smoking many times; but they are not necessary accompaniments, since they may be prevented by strict attention to cleanliness.

Smoker's Sore Throat.

On the glands of the throat, on the follicles, and the tonsils, an injurious influence is exerted by smoking. There is, in fact, a form of soreness of the throat in smokers, which may be considered as peculiar to them. It consists of an irritable state of the mucous membrane at the back of the throat, redness, dryness and a large soft sore condition of the tonsils which renders the act of swallowing painful. The state thus described is in no way to be considered as permanent when it has been excited, nor as universal amongst smokers, but it is occasionally difficult of cure, and it is far more general than is commonly known. I once examined the throats of fifty smokers of different ages and habits, and found in them the enlargement of tonsil so common, and the other appearances indicated so marked, that I think I could detect an immoderate smoker by these signs alone. It often happens that the enlargement of the tonsils exists for a long time without causing inconvenience and a damp, cold, foggy state of the air supervenes; then the evil, becoming exaggerated, is troublesome and painful; enlargement of the tonsils is detected, and the annoyance is markedly increased by any attempt, however brief, to indulge in a pipe. In the fifty cases to which I have referred, thirty-seven had enlargement of tonsil.

In watching the progress of smoker's sore throat, it is observable that the mischief is on the surface of the mucous membrane; it does not extend deeply into the tissues; it does not give rise to abscess and rarely to ulcer. It exists, usually, as an engorgement with thickening of the mucous membrane and profuse secretive action of the small glands, leading to soreness, to exfoliation, to actual mechanical difficulty in swallowing, and, it may be, to imperfection in speaking and singing. I have known it affect a public singer very seriously, producing a hoarseness and a want of firmness most annoying and painful. I have also known it keep up for a long time a persistent irritative cough.

The "smoker's sore throat" is more easily induced by the use of cigars than of pipes. When once it is fully established it is quite incurable so long as the cause that excited it is allowed to in excess, are liable to be deposited so as to form hard stone-like masses in the ducts of the salivary glands, or to be laid down on the teeth in the calcareous layer which constitutes the crust called tartar. I have seen these results follow smoking many times; but they are not necessary accompaniments, since they may be prevented by strict attention to cleanliness.

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On all the structures above named, the mucous membrane of the throat, and the mucous lining of the nasal canals, tobacco taken in the form of snuff exerts a prejudicial influence. I have sometimes seen a relaxed and sore throat persistently maintained by the habit of snuff-taking. The fine particles of tobacco make their way along the nasal tract until they reach the back of the throat, where they keep up a constant irritation.

Cancer from Smoking.

Connected with the forms of disease induced by tobacco beyond those which have been noticed in the present chapter, there is one other important question, viz.:—Does smoking produce cancer?

The first observations that were made on the origin, real or supposed, of cancer, from the use of tobacco, were confined to those forms of the disease in which it appears in the lips. But after a time the assumed danger grew and grew, until it has now become a fixed belief amongst a large section of the public, that cancer, in its general interpretation as a disease, may be produced by smoking, and that, in a word, the terms "tobacco" and "cancer" may be classed together in the order of cause and effect.

It is proper to break through this fallacy. Cancer was present for ages before tobacco was introduced as a luxury.

We find the disease in the inferior animals, in domestic animals, and even in some others which we might imagine would specially be exempt from it. Dr. Crisp actually discovered the disease in the pike.

When to these facts we add this last, that as a whole, cancer is more prevalent in our own community amongst the members of the female sex, who, as a general rule, do not smoke, we require no further proof that tobacco must be entirely separated from cancer as a direct cause of that particular malady.

I move next from the general to the special question. Can the smoke of tobacco excite, locally, in the tongue, or the throat—the disease cancer? The answer to this question must be indirectly in the affirmative. If it can, it does it clearly by acting as a substance irritating to the parts with which it comes in contact.

It might be inferred,—theoretically, yet safely,—that in persons of strong cancerous tendency, the irritation produced by the smoke of tobacco would summon into existence the local and much-dreaded mischief. But the truth is, that such occurrences are extremely rare, so rare, that I can recall no instance in which cancer, either of the tongue, throat, or cheek, has been connected with smoking. I have seen cancer of the tongue excited by friction against a rough and decayed tooth; I have seen cancer of the throat called forth by the irritation arising from the lodgment of a fishbone; and I have seen cancer form and progress in these parts without any apparent reason; but I have never met with a single instance in which tobacco smoke could be said to have brought out the disease.

If I were inclined to run into an extreme, I might indeed argue, from the facts in my possession, that the effect of tobacco is to stop the local change constituting the visible disease; but this argument would be unfair, because the experience of any one individual is too limited to allow him to speak, dogmatically, upon it. I content myself, therefore, with simply stating the facts that cancer of the mouth may occur and does occur in persons who do not smoke; that it does not occur specially in persons who do smoke; and that any extreme view in reference to tobacco as an exciting cause of cancer of the mouth is without foundation.

There is still one other form of cancerous disease which deserves consideration; I mean cancer of the lower lip. The lower lip is affected, not uncommonly, in the predisposed, with a variety of cancer called from its spreading and superficial character "epithelial cancer." It has been observed unquestionably of this cancer that it occurs frequently in persons who smoke short pipes, and that it breaks out at that part of the lower lip upon which the pipe ordinarily presses. Here therefore we may assume, without hesitation, that smoking excites the cancerous disorder; but this exciting cause is indirect in its action, inasmuch as it is connected with the pipe, and not with the tobacco. It has been found, by experience, that the mischief does not become developed in cigar smokers, nor even in those who smoke pipes which have a smooth surface, are of sufficient length and, as a consequence, are cool; but that the accident occurs from the use of the short cutty pipe, which, held very firmly in the lips without support from the hand, conveys a painful degree of heat.

The Heart.

The action of tobacco smoke on the heart has been very differently estimated by different writers. Some have conceived that it exerts no influence whatever, others that it exerts a most dangerous influence. The truth lies in separating functional from organic mischief. I do not think there is any evidence to show that smoking alone is capable of producing structural change either in the valvular mechanism or the muscular fibre of the heart. In persons who, from necessity or ignorance, subject themselves to an unnatural degree of muscular exercise, and who make, as a consequence, extreme demands for labour on the pulsating organ which knows no rest, in such, I believe, the effect of a pipe daily (I do not mean of many pipes), is to put a curb on the extra excitement, to prevent over-action, and to arrest the excessive development of the heart.

So much for the influence of tobacco on the structural diseases of the heart. The rule varies when we turn to the matter of functional derangement. There cannot be a doubt that inveterate smoking interferes very seriously with the contractile force of the central organ of the circulation. No one can observe the influence of nicotine, after its direct administration, without feeling assured that it cannot be imbibed without inducing a paralysing effect on the heart, irregularity of action, and faintness. The conditions brought on by tobacco in this way are often developed suddenly, and last for many minutes or even for hours at a time. The symptoms induced are characterised by palpitation, a sensation as though the heart were rising into the throat, a feeling of breathlessness and an insupportable pain in the region of the heart.

Pain of a spasmodic kind extends also to the muscles of the chest, and occasionally to those of the arms, especially of the left arm.

Here again the symptoms depend on some peculiar circumstances. To secure their development immoderate smoking is essential, and the characters of the pipe and of the tobacco also play most important parts. The foul pipe, the strong tobacco, and the strong cigar, are the agents which tell most effectually and seriously. Further, there seem to be conditions of body which favour the action of the poison. When, for instance, the muscular system,—including the heart, which is a muscle,—is greatly fatigued or oppressed, as after excessive exercise or mental distress, or when the secretions are deranged so that nicotine, imperfectly secreted, accumulates in the blood, then, after indulgence in tobacco, paralysis of the heart more readily supervenes.

The Lungs.

Tobacco has often been credited as the cause of pulmonary consumption, of chronic bronchitis, and of other affections of the chest, and I confess I have been driven by the force of repeated, and, as it has seemed to me, conclusive experience, to trace certain mischiefs, in individual examples, to the use of the pipe or cigar. I am sure, moreover, that in many such instances, great and lasting good has been effected by forbidding a continuance of the luxury.

That considerable injury to the lungs may follow from smoking during peculiar conditions of the system which have been brought on by other and more determinate causes is certain; but, after a rigid analysis of all the facts in my possession, I doubt whether smoking can be adduced as a prime cause of disease of the chest. I have been fortunate in having at command unusual facilities for conducting an inquiry into the precise relationships that exist between the practice of smoking and the presence of disease in the lungs. The position I held for a great many years as a physician to the "Royal Infirmary for Diseases of the Chest," gave me the opportunity of instituting an analytical research on this subject not before attempted. To this analysis I direct the attention of the reader.

The plan adopted in the collection of the facts was very simple. The apothecary of the infirmary was directed, when he entered the name, address, age, and duration of the illness of each patient, to add to the record, in the cases of all persons except children, the information whether they did or did not smoke. The apothecary had nothing to do in the matter of inquiry into the nature of the disease; that was left for me to determine; and as, during the greater part of the time in which the investigation was carried on, I saw, by rule, only six *new* patients per day, I had leisure to make myself sure of the precise nature of each form of disease that came before me.

The data thus obtained related to the two most prominent, and indeed to the only two diseases of the chest that we need specially discuss, namely, Consumption and Chronic Bronchitis. The facts elicited by this inquiry are as follow :—

In regard to Consumption:

There came under notice—	
Cases of the total number of	361
Out of this total, there were—	
Persons who did not smoke	225
Persons who did smoke or had smoked	136
Thus, out of 361 consumptive persons—	
Those who did *not* smoke showed an excess of	89
Out of the total of 361, there were—	
Males	230
Females	131
Out of the 230 males—	
The number who smoked was	136
The number who did not smoke was ...	94

Thus out of 230 consumptive males—

The smokers showed an excess of ...	42

In regard to Chronic Bronchitis, including Asthma:

There came under notice—

Cases to the total number of	475

Out of this total there were—

Persons who did not smoke	338
Persons who did smoke or had smoked	137

Thus out of 475 persons suffering from Chronic Bronchitis—

Those who did *not* smoke showed an excess of	201

Out of the total of 475 there were—

Males	249
Females	226

Out of the 249 males—

The number who smoked was	137
The number who did not smoke was ...	112

Thus out of 249 males suffering from Chronic Bronchitis—

The smokers showed an excess of ...	25

It suffices to read the figures given above, to learn that neither consumption, nor bronchitis in the chronic form, can be induced primarily by smoking; for while it is true that amongst the male sufferers those who smoked were the most numerous from both the diseases named, the circumstance is merely coincidental. Had the persons whose cases were recorded been in health, had they been passing before a recruiting sergeant for entry into military service, for instance, there would have been a similar comparison, in regard to numbers, between the smokers and those who did not smoke. I am obliged, consequently, to state that amongst the male sufferers from consumption and bronchitis, a small majority indulged in smoking. Taking the whole of the sufferers, fifty-seven per cent. were smokers, forty-three per cent. were not smokers.

It would, obviously, be false to this question to let it rest solely on the statistics derived from one sex, for women are as susceptible as men to the two diseases named. Here then is a touchstone. Are women, who as a body are not smokers, and men who are not smokers, if placed together as one class, less subject to these disorders than men who are smokers? We turn to our tables and find that the combined class is *not* less subject, and that on the large scale the luxury of smoking does not come into the list of causes at all.

Smokers in general will doubtless breathe more freely after this exposition; but it would be unfair were they to be allowed to read these facts singly and unqualified. When it is said that smoking is not a cause of the diseases to which attention is now being called, it is not also conveyed that when these diseases are once set up, smoking does not aggravate them; nor that when certain efficient causes are at work to induce these affections, the use of tobacco does not lend weight to the result. I am convinced it does both these things, and I could quote example upon example where persistence in smoking has tended to sustain and confirm the malady. This is most true in regard to consumption; for consumption is a disease which, with hereditary taint often lying at the bottom of it, is capable of being excited by the long-continued inhalation of impure air. It is a disease that is intensified when the sufferer from it inhales in the smoke of tobacco, carbonic acid and the various other products in tobacco smoke the action of which is so injurious on the blood. There is also another way in which tobacco does harm to consumptive persons. There is never any affection of the lungs, never any arrest in the process of breathing, without some derangement in the digestion. Indirectly, the stomach requires oxygen; and without oxygenated blood it fails to produce its digestive fluid freely. Fresh air gives appetite. Smoking, as every one knows, destroys appetite and enfeebles digestion. Consumption does the same, and one of the most common presages of consumption is indigestion. Such indigestion, intensified by the act of smoking, adds, therefore, trouble upon trouble, and hastens that destruction which the disease of itself is sufficiently competent to enforce.

For these reasons I have made it a rule for years past to insist that every consumptive patient should abandon the pipe and cigar, and I have found a rigid obedience to this rule worth many a formal prescription.

In Chronic Bronchitis, in the ordinary run of cases, the use of tobacco is also injurious. The smoke acts as an irritant to the already irritable surface of the bronchial tubes, it keeps up cough, it increases indigestion, which in this disease as in phthisis and for the same reasons, is a troublesome attendant, and it stands constantly in the way of successful treatment. I have seen many times a cough, following upon a cold, remain persistently in persons who smoke, and then immediately disappear when the smoking has been suspended.

CHAPTER XII.

NERVOUS DISEASE FROM TOBACCO.

THE phenomena of disease of the nervous system induced by tobacco are of three kinds, viz.—those which are manifested (*a*) Through one or other of the senses; (*b*) Through the brain; (*c*) Through the spinal cord, and the volitional and organic nerves proper. In every case the symptoms presented are indicative of a defective activity in the nervous structures.

Effects on the Organs of Sense.

After long indulgence in smoking, if the eye be the organ influenced, there is a difficulty and obscurity of vision. In reading, the letters become confused and the lines dance, as it were, before the reader; sometimes, too, bright images appear, and small luminous specks float in the sight on looking into space. I have also heard complaint made of deep-seated pain in the eye, particularly on looking at white objects, and I have even known dizziness and nausea produced by overstrained action of the eyes during this irritable condition.

In inveterate smokers the pupils are usually unnaturally dilated, and this dilatation increases during smoking. The effect is due to the absorption of nicotine; for I have observed the same dilatation follow the action of nicotine simply. If the light be low, this dilatation of pupil produces but little embarrassment; if, on the contrary, the light be strong, vision is greatly impaired for the time; indeed, the light cannot be borne as in health. The influence exerted by the nicotine is directed in this case on the circular muscular fibres of the iris, by the action of which its aperture is closed. These fibres are, I think, paralysed by the nicotine in the same way that we have seen the muscular fibres of the stomach and heart paralysed by the same agent. On this, the radiating fibres by which the aperture of the iris is opened are allowed passively to contract, and the pupil is unduly dilated.

But the symptom which of all others marks, through vision, the fact that tobacco is acting injuriously, is the long retention of images on the sensorium when the eye itself is withdrawn from them. I knew a smoker once who after excessive indulgence could retain a faint image of any bright object on which he looked, for so long a period as six minutes after the eyes were withdrawn from it. If, for instance, he looked at the window in the daylight, the picture of the window was impressed on his retina and remained there, the panes of the window being filled up with what seemed to him red light, while the bars were dark.

If a bright light, such as a lamp or a candle, be placed before the eye of the confirmed smoker, the impression is often retained, but no image is retained that has not a certain size and luminosity; letters of books are lost, as also are the minutiæ of objects which present many lines or figures. That the symptom here spoken of may arise exclusively from smoking is proved by the fact, that it begins and is intensified during the act, and gradually dies away as the cause is withdrawn. Whenever it appears, it is a good indication to the smoker that he has carried the habit far enough, at least for the time.

From the eye we may turn to the ear as one of the other organs of sense presumed by some to be affected by tobacco. In respect to this organ and the modifications to which it is subjected in the smoker, the same rule, in my opinion, holds good as that which relates to the eye. I have no doubt as to the existence of functional derangement of the sense of hearing after long indulgence in tobacco, the change being manifested by certain well-marked phenomena, which phenomena usually attend, and are coincident with, the disordered state of vision and the general signs of indigestion which have already been described.

The specific symptoms affecting the hearing are at first those of confusion with an inability to appreciate distinctly, sounds that are either very soft or unusually loud. This inability gives rise to restlessness and uneasiness on the part of the listener, who often asks questions with respect to articulate sounds which to others present are perfectly and distinctly heard. After a short period, another symptom appears, viz., a sudden sharp ringing in the ears. This symptom will occur not necessarily during smoking, but at intervals afterwards. Sometimes, if attention be carefully paid to the subject, it may be discovered that some external noise, very slight in character, —such as the ringing of a distant bell, or the whistling of the wind through a chink, or some far-off musical murmur,—has produced the sound that is heard with so much exalted intensity. At other times the symptom comes on apparently without any provocation; the man is reading, walking, eating, or is engaged in some amusement, when suddenly there darts through one or other ear, a sharp, shrill, drilling ring, which always seems to come from without, and lasts often for two or three minutes at a time. No pain attends this phenomenon, that is to say, no actual ache, although the annoyance is extremely great. Strangely, too, the ear is not deaf during the time, for, if a watch be placed to it the ticking is very distinctly heard; still more curiously, both ears are scarcely ever affected at one and the same moment. If the symptom be very much prolonged it may be attended with giddidess and nausea, but in the majority of cases after running through three stages (a commencing, an intensified and a declining stage), it abruptly terminates.

With the exception of the senses of sight and hearing there is but little to be said further regarding the influence of tobacco on the sensory organs. It is probable, however, that after long smoking the sense of smell may, to a certain degree, be impaired; but the rule is not general, for I have known many confirmed smokers who have possessed the most keen olfactory sense—a sense more acute than is possessed by many who are unaccustomed to the pipe. The case differs in regard to snuff-takers. It is not to be denied that constant snuff-taking does destroy, sometimes completely, the sense of smell. I do not know that I can recall any one example in which indulgence in smoking has produced paralysis in the nerves of taste. I have heard of cases of the kind, but have never met with them; and I am compelled therefore to assume that they are either extremely rare, or that the statements regarding them have been based on insufficient evidence. These remarks apply equally to the sense of touch.

Effects on the Brain.

Many dangerous diseases of the brain are said to result from smoking, but we soon discover on inquiring into the facts that the hypothesis loses its ground. *Apoplexy*, for instance, a disease so often adduced, has no necessary connexion with the indulgence of the smoker. Looking back through an extended experience I find, that out of eighty cases where persons who had, as it was thought, died suddenly from apoplexy, not more than eleven were really proved to be true examples of the disease, and of these eleven, six were women who did not smoke, three men who did not smoke, one a moderate, and one, perhaps, an immoderate smoker. I cannot, therefore, suppose that smoking, of itself, produces apoplexy.

It is impossible to say as much in favour of smoking when the disease called *vertigo* is mentioned. I have undoubtedly known in examples of extreme indulgence, the confusion of vision and ringing in the ears—already described—accompanied by symptoms of giddiness and unsteadiness commonly known under the name of vertigo. It may be that the vertigo is dependent, to a great degree, on the aberrations of function in the organs of sense, and that the brain itself is not seriously affected. Nevertheless, I can conceive that whatever would influence injuriously the sensory system, would in like manner also affect the brain.

In respect to *the influence of smoking on the mental faculties*, there need, I believe, be no obscurity. When mental labour is being commenced, indulgence in a pipe produces in most persons a heavy, dull condition, which impairs the processes of digestion and assimilation, and suspends more or less that motion of the tissues which constitutes vital activity. But if mental labour be continued for a long time, until exhaustion be felt, then the resort to a pipe gives to some *habitués* a feeling of relief; it soothes, it is said, and gives new impetus to thought.

This is the practical experience of almost all smokers, but few men become so habituated to the pipe as to commence well a day of physical or mental work on tobacco. Many try, but it almost invariably obtains that they go through their labours with much less alacrity than other men who are not so addicted. The majority of smokers feel that after a day's labour, a pipe, supposing always that the indulgence of it is moderately carried out, produces temporary relief from exhaustion. Further, in some persons of great energy and industry, exertion, both mental and bodily, is often followed up so intensely that, owing to the actual severity of the effort to which they have subjected themselves, they cannot afterwards sleep. They are excited, and are too tired for rest; their mind is chaotic, and revolves rapidly over passing events, retaining nothing long, and dissatisfied with all. In this condition there can be no doubt that a pipe sometimes produces a soothing effect, causing mental rest, partial oblivion of the past, and a tendency to that natural sleep which "knits up the ravelled sleeve of care."

It is not, however, necessary in accepting this argument to accept tobacco as a requirement of the natural life. The excessive labours to which I have referred are altogether contrary to natural laws; for in this day we have run into the extreme of industry, and have carried our competition to the extent of folly. While, therefore, it would be implied that even to the natural man such adventitious aids as tobacco are unnecessary, it may be admitted that our social exigencies override our philosophies; and that as the individual man cannot by himself create a social revolution, he may be pardoned if he is too often led to bend lowly to custom, and seek in the unnatural conditions in which he is placed, unnatural, or perhaps, under the circumstances, I might almost say, natural remedies. For the most natural *remedies* are, in truth, unnatural measures, since they imply, in the necessity that calls for them, a primitive departure from nature.

The question remains, whether the habit of tobacco smoking produces *insanity?* I believe there is no evidence whatever of the production of any form of insanity by smoking. If such a source of insanity existed, it would show itself immediately and broadly in the differences of numbers between the insane of the different sexes. The number of insane male patients would naturally be increased in proportion to the excess of males who smoke, over both insane males and females who do not smoke. But no such a rule is even approached; no special asylum, no country through its asylums, has shown such a rule.

Effect on the Volitional and Organic Nerves.

The effects of tobacco on the spinal cord, from which the volitional nerves arise, and on the cord of sympathetic ganglia are often pronounced. An injurious influence on the spinal cord and its nerves would be shown in the production of external insensibility, or in disturbed action of the muscles, by convulsion or paralysis. An injurious influence on the sympathetic system would be shown by an interference with the supply of blood to the different organs of the body, and by perversion of the functions of the secreting organs to which the sympathetic nerves are distributed.

The fact is demonstrative that tobacco has the power of modifying the functional activity of both these systems. The nicotine plays a very important part on the motor fibres of the spinal nerves, and probably on the cord itself. It excites through these structures muscular agitation, followed by temporary suspension of action and paralysis. In like manner, tobacco smoke has the property of acting on the sympathetic system of nerves, exciting them to produce muscular spasm, followed by deficient power. It is owing to this circumstance that internal pain, spasm of the stomach, and vomiting are produced during the first attempts at smoking, and that the heart palpitates and becomes enfeebled. It is from the same cause, long continued, that the organs of organic life are so irritable, sluggish, and powerless in confirmed smokers.

Tobacco smoke also exerts a temporary action through the sympathetic nerves over the structures which supply the secretions—the glands. In the early stages of smoking it excites free secretion from all the glands of the upper part of the alimentary canal, and in regard to the salivary glands, it retains this power in the individual often throughout life. Probably it affects the pancreas, and the other glands lower in the digestive system in a similar way. From ordinary smoking, I do not think anything more important occurs in relation to secretion; but from immoderate smoking the over-action may run into paralysis, and the process of secretion may become uncontrollable.

These effects of tobacco on the nervous system were described in a work of mine published ten years ago, since which time I have on two occasions seen them exhibited in a painful degree. In one instance I saw the combined actions of smoking and taking snuff, produce a complete paralysis of the nerves governing the secretion of the saliva, with the result of inducing a permanent and profuse salivation. In the other instance, I witnessed a death produced purely by continued smoking. An unfortunate devotee to the habit, a man of active business pursuits, smoked in one day, under the pressure of some additional work, forty cigarettes and fourteen cigars. I found him with his pupils widely dilated, his skin cold, clammy, and perspiring, his speech faltering, and his mind uncertain. His pulse was soft, full, and feeble, his utterance difficult, and his lower limbs paralysed. He died from organic nervous paralysis, with accumulation of fluid in the bronchial passages.

Conclusions.

Smoking produces disturbances: (*a*) In the *blood*, causing undue fluidity, and change in the red corpuscles: (*b*) in the *stomach*, giving rise to debility, nausea, and in extreme cases, vomiting: (*c*) in the *mucous membrane* of the mouth, causing enlargement and soreness of the tonsils, —smoker's sore throat,—redness, dryness, and occasional peeling off of the membrane, and either unnatural firmness and contraction, or sponginess of the gums: (*d*) in the *heart*, producing debility of that organ, and irregular action: (*e*) in the *bronchial surface of the lungs* when that is already irritable, sustaining irritation, and increasing cough: (*f*) in the *organs of sense*, causing, in the extreme degree, dilatation of the pupils of the eye, confusion of vision, bright lines, luminous or cobweb specks, and long retention of images on the retina; with other and analogous symptoms affecting the ear, viz., inability to define sounds clearly, and the occurrence of a sharp ringing sound like a whistle or a bell: (*g*) in the *brain*, impairing the activity of that organ, and oppressing it if it be duly nourished, but soothing it if it be exhausted: (*h*) in the *volitional and in the sympathetic* or *organic nerves*, leading to paralysis in them, and to over-secretion from the glandular structures—over which the organic nerves exert a controlling force.

The descriptions submitted in the preceding chapters bear on the effects of tobacco as they are seen at various periods of life. The effects of this agent, often severe, even on those who have attained to manhood, are specially injurious to the young who are still in the stage of adolescence. In these the habit of smoking causes impairment of growth, premature manhood, and physical prostration.

If the views thus expressed in relation to the influence of tobacco on individuals, be true, we are led without difficulty to the consideration of the influence exerted by the habit on communities and on nations. That which smoking effects on a man, either as a pleasure or as a penalty, it inflicts on every national representative of the same man, and taking it all in all it is fair to say, that smoking is a luxury which any nation, of natural habits, would relinquish. If a community of youths of both sexes, whose progenitors were finely formed and powerful, were to be trained to the early practice of smoking, and if marriage were to be confined to the smokers, an apparently new and a physically inferior race of men and women would be bred. Such an experiment is impossible as we live; for many of our fathers do not smoke, and scarcely any of our mothers, and so,—chiefly to the credit of our women, be it said,—the integrity of the race is fairly preserved. With increasing knowledge we may hope that the same integrity will be sustained, but the fact of what tobacco can do, by its extreme action, is not to be forgotten, for many evils are maintained because their full and worst effects are not recognised.

On the ground of the functional disturbances to which smoking gives rise in those who indulge in it, an argument may be used which cuts sharply, because it goes right home. Put down the smokers of Great Britain at a million in number—they are more than that, but let it pass.—Why should there exist, perpetually, a million of Englishmen, not one of whom can at any moment be writ down as in perfect health from day to day? Why should a million of men be living with stomachs that only partially digest, hearts that labour unnaturally, and blood that is not fully oxidized? In a purely philosophical point of view, the question admits of but one answer; viz., that the existence of such a million of imperfectly working living organisms is a national absurdity.

CHAPTER XIII.

DISEASE FROM THE USE OF NARCOTICS.

OUR modern life cultivated far beyond the life that has existed under other civilizations is nevertheless subjected to artificial treatments, as extreme in their evils as any the most uncivilized have brought into action. The ancient Scythian built his rude tent, pitched a fire in the midst, threw the seed of the Indian hemp on the hot stones and then inhaled the narcotic vapour that rose with the heat, until his senses were lost to him. There are Easterns who, to this day, bury their cares in the sleep produced by haschish, the same agent in another form. The Indians of the Andes drink the juice of the narcotic fruit the *Yerba de Nuaca*, or red-thorn apple, and straightway, in delirious dream, enter into communion with the spirits of their departed dead. These doubtless seem to us guilty of rude and barbarous indulgence for which there is neither reason nor excuse.

In our own and other equally civilized communities there exist, at this time, considerable populations of men and women who indulge in practices of a similar and equally injurious kind, and who, strangely enough, pervert the advances of science to their set and wanton purpose. The physician, consequently, is often called upon to witness symptoms of disease which actually are produced by the improper use of the instruments of cure he discovers or invents for the good of the world. The commonest agents thus misapplied in our life of to-day are opium, chloral-hydrate, chloroform, ether, the compound sold under the name of chlorodyne, and absinthe.

Disease from Opium.

From the experience I have earned of the practice of opium-eating I infer that such practice is dying out in this country. Twenty years ago, when my sphere of observation was much more limited than it is now, I had a larger experience of those who were indulging in this vice than I have at present. The decline of instances of the kind has also been gradual, so that I believe no accidental error leads me to this practical conclusion. The reason of the decline of the practice does not indicate, however, any marked improvement in the public mind. It shows, as it seems to me, the mere fact that there is what may be called a change of narcotic taste, for certainly, while opium-eating is a less prominent indulgence, the use of other narcotics has signally increased, with results quite as injurious to the health and happiness of those who make the use of narcotics a vicious habit.

The victims to opium, as far as my knowledge of them extends, are of adult age or in the middle or decline of life. They have been led into the habit, originally, by having to use opium for the purposes of relieving pain or of inducing sleep. Beginning with small doses of the narcotic, doses of from one to two grains, they have increased the quantity until it has reached to ounces in the day. The "Confessions of an English Opium Eater" have somewhat informed the public of the effect of the drug on the physical and mental organization of man. But those splendid flashes of confession must be accepted as coloured by the brilliant imagination of their author, and not as representing the effects induced on less gifted persons who stupefy under the drug and bring upon themselves a specifically induced malady.

The phenomena of disease from opium are fairly uniform and long persistent. The first phenomena are those of strange and wandering dreams, in which, as under haschish or diluted nitrous oxide, space and time seem to have undergone entire change. Space is extended so that objects near at hand appear to be immeasurably distant and objects of small size exceeding large. Yet with all this difference the sense of proportion remains correct, and distance, which looks so great, is still, as it were, within the reach of the observer if he move to the object observed. Time is extended into equally vast intervals, or conversely, the ideal of a lifetime of events is compressed into the period of a mere second. Then the dream slowly passes into unconscious existence, and after a prolonged sleep there is a return to the every-day life, but not to the happiness that should naturally attend it.

With the return to the simply conscious state the exaltation of mind, which previously was so distinctive, is now replaced by a sense of depression that is hardly describable. I have tried to take such description from the lips of the sufferer, but have, evidently, never succeeded in obtaining the true and full subjective history. The depression, felt mentally, appears as some great loss of intellectual power of memory, or of inability to co-ordinate ideas. With this there is an overwhelming horror of impending danger which must occur and yet by the suspense of its occurrence is the more terrible. As the mental agitation subsides, a series of subjective physical phenomena succeed which are equally severe. There is absence of muscular power, a sense of inability to speak with correctness and energy, an oppressive feeling of failure of the digestive organs, and, without nausea, a disgust for food. Together with these mental and physical disturbances there is the morbid and insatiable appetite and craving for the drug, in repeated doses. A new life, in short, has been engrafted on a new food, and thereupon the desire for the food has lapsed into what may be called an insatiable instinctive faculty.

The physical changes which attend this process, and which are objectively manifest, are slowly developed and are of far less distinctive character than those induced by alcohol. The brain becomes accustomed to the sedative, and the deep narcotic effect which at first was so peculiar a symptom ceases, to be replaced by a torpid restlessness and a half-conscious languor, with an inaptitude, specially, for any active physical occupation, The digestive organs soon fail in their functions, and food, for which, as I have already said, there is feeble desire, is imperfectly digested unless it be taken in very small quantities. The function of the liver is reduced in activity so that the secretion of bile is diminished : the bowels are constipated, and complaint is made of persistent sense of feebleness and vacuity in the abdominal region. From the inability to take, digest, and assimilate food, there is a wasting of the body ; the muscles are extremely wasted; the skin shrinks and shrivels, and the characteristics of a premature old age are developed. The pulse at all times, save when the action of opium is renewed, is quick, thin and irritable; the body is feverish, the lips are parched and the tongue, dry and red, is sometimes deeply furrowed. The eye is dull at all times, except during the periods when the drug is exerting its full influence; then for a brief interval, which becomes less as the indulgence is prolonged, it gives forth a fitful, brighter ray.

The final action of opium, when indulgence in its use is carried to the extreme, is seen in failure of the nervous power. The centres of nervous matter, as if these like the muscles were undergoing waste, lose their activities, and thus paralysis of some portion of the body is a resultant phenomenon. The lower limbs fail first, then the muscles of the back lose their stimulus and energy; and the body lame and bent, like the body of an old man, falls into the decrepitude of senile degeneration. Death from inanition, owing to complete failure of the digestive power, closes the scene.

Under the first influence of opium three degrees or stages of action are marked out, viz., a stage of excitement, a stage of delirious torpor and a stage of extreme depression of mind and body.

But after continued use there are truly but two stages, one of excitement, another of depression.

I have only spoken as yet of the influence exerted by opium on those who take it by the mouth in the solid or dissolved form. When opium is smoked its action is modified in many particulars, for then, with the true narcotic vapours arising from it there are other products of combustion which exert an independent power. The results of this mode of indulgence are extremely rapid in their course and vehemency. The excitement is more intense, the delirious torpor more prolonged and the after-depression more severe. In correspondence with these intensities of effect the ultimate destruction of nervous function is the more ready and determinate. Happily into our domestic English life this vice of opium-smoking has found no admission. I have been obliged to seek the knowledge I have of it from those of whom it may still be said socially,

> "Et penitùs toto divisos orbe Britannos."

A victimised few, very limited, and hopelessly out of the range of scientific instruction, upon whose miseries, though I could write much, I need not further dwell.

Disease from Chloral-Hydrate.

Although it is only six years since Dr. Liebreich discovered the narcotic properties of the hydrate of chloral, and not quite so long since I introduced his facts for the first time in this country to audiences of scientific men, there has sprung up here, and I believe in all other civilized communities where the narcotic has become known, a morbid habit of indulging in its use. It is most remarkable how quickly this habit was developed, and not amongst our lower, but amongst our middle and upper classes of society. Within six months after the introduction of chloral I had met with many instances of such abuse of it, and had become acquainted with two, in which the effect had been carried, with intention, to an all but suicidal end. By the close of two years, the number of facts on this subject had become so great that I felt it a public duty to call attention to them in a Report made to the British Association for the Advancement of Science, at its meeting in Edinburgh in 1871. I explained, that as there are alcoholic intemperants and opium-eaters, so there were those who, beginning to take chloral-hydrate to relieve pain, or to procure sleep, acquired the fixed habit of taking it several times daily, and in full doses. I showed also that this growing practice was alike injurious to the mental, the moral, and the physical organization, and I indicated the phenomena of disease which are induced by this perverse application of one of the most useful agents that medical science has placed in the hands of the physician for the purpose of curing disease. Although the announcement was much discussed at the time by the public press, and has been confirmed a hundred times since by other observers, but little good, I fear, has followed the disclosure. At the present time the practice of chloral intemperance is still increasing, and *chloralism*, as I may not inaptly designate it, is becoming capable of being classified as a distinct and serious addition to the family of induced diseases of modern life.

Originally those who habituated themselves to the use of chloral were persons who had taken the narcotic for the purpose of relieving pain, and who, when the physician had ceased to prescribe it, prescribed it for themselves. But soon, other classes began to take it on their own account. These were alcoholic inebriates who had become afflicted with the intemperate type of the alcoholic malady. They, in their hours of sleepless depression, found a solace in the new narcotic which brought rest and sleep: therefore, instead of flying from the evil with which they were possessed, they fled to another that added one more to the injuries they already bore. These inebriates, men and women, still furnish a large number of sufferers from chloral.

The phenomena of disease induced by chloral-hydrate are many. The digestion suffers very early after the commencement of the indulgence. The tongue becomes loaded and dry; there is frequent nausea, occasional retching and vomiting, frequent eructation, and constant sense of oppression from flatulency. The appetite becomes capricious and irregular, and all the secretions are unnatural. The craving for the narcotic begins to be a morbid desire, and sleep cannot be obtained unless the sleep-promoter be at hand. The first stage of chloral disease is presented in these symptoms.

When the phenomena have been developed to this extent, the nervous system begins to show disturbance. The action of the heart is rendered irregular and intermittent, the mind irresolute and irritable, the hands and lower limbs unsteady, the face is easily flushed, and the eyes are reddened under slight excitement. Sleep is impossible, unless it be enticed by the drug, and when it comes it is heavy, noisy, and restless, yielding an insufficient restoration of animal power.

These phenomena are due to the simple narcotic action of chloral-hydrate, and of themselves might be evanescent. After a time another series of organic changes is induced, owing to the chemical decomposition of the agent within the body. When chloral-hydrate is exposed to the action of an alkali, it is broken up into two definite chemical compounds, formic acid and chloroform,—the formic acid combining with the alkali to produce a salt, and the chloroform becoming liberated as vapour. In the blood, this same change takes place from the action of soda, an alkali which is naturally present in that fluid. Thus, the blood becomes charged with the salt known as formate of soda, is increased in specific weight by this circumstance, and is brought, indeed, into a condition similar to that which is induced in the blood of men who have been subjected for a long time to foods preserved by the process of salting with common salt and saltpetre. The blood is rendered unduly fluid, and, with its plastic constituent in persistent solution, it readily escapes from its contained vessels. In this manner diseases closely resembling scurvy and purpura are induced, and are sometimes extremely difficult of cure. I have known the body covered with purpuric blotches from this cause. One other symptom of disease occasionally follows the habitual use of chloral-hydrate, and that is jaundice. The same phenomenon is also an occasional complication of scurvy and purpura brought on by other causes.

It is not until chloral-hydrate has been indulged in for from five to six weeks that these phenomena of disease from it occur, and even after long periods of receiving it there is no real danger, unless the dose taken be large and be often repeated. But I have known a man who commenced by taking twenty grains at night, for the legitimate purpose of getting ease from pain and securing sleep, increase the dose to thirty, forty, and even sixty grains, and repeat the same twice or more in the twenty-four hours. Such an excess quickly leads to all the train of symptoms of disease to which I have drawn attention. I should add, as a final word on this subject, that although I have never met with an instance in which the use of chloral-hydrate has led to incurable disease, I have known four instances in which fatal results have all but followed a dangerously excessive dose taken accidentally by those who have habituated themselves to its influence. It is my duty, therefore, once more earnestly to protest against the abuse of an agent which is in the strictest sense medicinal, and which should be employed only by the professed healer.

Disease from Chloroform, Ether, and Chlorodyne.

Occasionally, since it has been in use as a general anæsthetic, I have known *chloroform* to be taken habitually as a narcotic luxury, by inhaling it in the form of vapour, until the sleep resulting from it was obtained. The phenomena induced after a long period of indulgence in the habit are similar to those caused by chloral-hydrate, but without the deterioration of blood which follows the use of the last-named substance.

The morbid craving for chloroform is always soon pronounced. The digestive organs are disturbed, the action of the heart becomes irregular, and sleep is rendered imperfect, except when it is artificially procured. The nervous control over the muscular movements is weakened, and derangements of the liver, with jaundice, are frequently recurring symptoms. Chloroform is so insoluble in the blood, and so volatile, the effects it produces are not necessarily permanent, nor dare I say that I have ever seen permanent organic disease occasioned by it. The danger of using it habitually is, nevertheless, extremely great. One of the few victims to the habit whom I have known died from an overdose.

I have seen in two instances some phenomena of disease produced by the inhalation of *ether*. They were transient symptoms; but, so long as they lasted, were severe. The sensations reported to me as caused by the vapour, when inhaled frequently, were those of fulness in the head, unsteadiness of gait, a sense as if about to fall forwards, and a persistent dyspepsia. During the time of the inhalation the mental phenomena were of the same order as those which follow the administration of laughing gas. There was a tendency to hysterical laughing and sobbing, an extended idea of space and time, and extreme sensitiveness to sounds, which symptoms remained for hours after the inhalation had ceased. The craving for the narcotic was again a distinctive feature, but I have been unable, so far, to trace any real organic lesion as a result of the indulgence. In the instances that have come under my observation, sufficient time was not given for the development of actual modifications of structure in the organic mechanism.

The fluid sold under the name of *chlorodyne* is supposed to be a compound of morphia, cannabis indica, hydrocyanic acid and molasses, but I do not believe that any absolute analysis of it has yet been made. Chlorodyne is a sedative and narcotic, and is much more commonly employed as an habitual narcotic than either chloroform or ether. The phenomena of disease it induces are so like those caused by opium, I should but repeat the record were I to write a special history. The dangers from it also run parallel with those from opium.

Disease from Absinthe.

A more formidable source of induced disease than any of the three last-named narcotic fluids and, indeed, than all of them taken collectively, is the fluid known and sold under the name of *absinthe.* Until recently the use of absinthe has been best, or rather worst, known in France, but now it is creeping into English life, and is, I fear, becoming a new and extending vice in London. Absinthe is made by adding the essence of wormwood—absinthium,—to alcohol. Five drachms of the essence are added to one hundred quarts of alcohol.

In watching the phenomena of disease produced by absinthe, we are really watching some of the phenomena that are due to alcohol, and which have already been described. But the absinthium itself possesses an injurious action, which may be called specific. It has been discovered that this essence simply, when administered in doses of from thirty to fifty grains to dogs and rabbits, induces symptoms of terror, trembling, stupor and insensibility. In larger doses it induces epilepsy. When, therefore, this essence is added to alcohol, a specific influence to disease is super-added, to which extreme significance ought to be attached.

Absinthe taken in what is considered to be moderate quantities, viz. from one to two wineglassfuls in the day, leads, in a short time, to a permanent dyspepsia. The tongue is rendered dry, the mouth parched, and the throat irritable. After a while all desire for food is destroyed, until such desire is prompted by the agent that has vitiated the natural appetite. At last no food is taken except under these conditions.

When the habit of indulging in the poison becomes established, the nervous system shows signs of disturbance. These signs consist first of irregular action of the muscles, so that muscular movements, which should be purely under the control of the will, are made involuntarily. As the disease progresses, during or even in the absence of torpor, the victim is seized with epilepsy, which once started, recurs with increasing frequency and activity.

From the lips of one who indulged in absinthe up to the extent of inducing the epileptiform stage, but who has, I trust, reformed, I learned that the first effects closely resemble those that are described as arising from the action of the eastern haschish, the narcotic principle of which is the extract of Indian hemp. The partial insensibility caused by the absinthe is attended with the ideal existence of long intervals of time, in which the events of a whole life are arrayed and reviewed, followed by terrific hallucinations, intellectual obscurity, and an unconscious struggle, as if for life.

From the limited experience I have yet at command as to the ultimate influence of absinthe upon those who indulge in it, I am led to hope that the disease it induces, even when it goes on to the specific epilepsy, is curable if it be treated in time and the cause be absolutely withdrawn. Unfortunately the first effort of the physician to induce his patient to abstain from absinthe is too often fruitless, and then the course of the malady induced by it is, without a check, towards and to incurable epileptiform seizure, paralysis, and death.

If from our own country I were to pass to less civilized countries, it were easy for me to find many other narcotic and poisonous agents to the uses of which men have habituated their bodies to shorten their lives. The swallowers of haschish of Damascus and the East; the amanitine drinkers of Kamschatka; the arsenic eaters of Styria—these might well come under review in this place. I must be content to name them, merely, and to close the present chapter with what has been told respecting the diseases induced by narcotics in the highest types of modern civilisation.

CHAPTER XIV.

DISEASE FROM FOODS.

DISEASE from mere gluttony, whatever the extent of it may have been in luxurious past civilizations, and whatever degree of it may exist in present civilizations other than our own, is certainly not a marked vice amongst the English people. My experience fails to supply me with a single instance in which it could be said that disease originated from the habitual excess of any particular food taken for the sake of gratifying the sense of taste; although, possibly, many persons have actually gained, by imitation, the bad habit of eating more of certain foods than has been simply necessary for the full demands of natural want. Whatever diseases occur from food may, therefore, in the main, be attributed not to vitiated desire, but to accident, ignorance, or necessity.

Substances taken as foods may be the carriers of poisonous products; thus water may be the carrier of the organic poisons of the spreading diseases, or of lead and other inorganic poisons. Or substances which are poisonous may be taken in mistake for innocuous edible articles, as when the poisonous mushroom is mistaken for the edible. Or substances which under ordinary circumstances rank as true foods may, either by changes within themselves or by misapplication, induce disease.

The study of the first two of these classes relates to the influence of foreign agencies acting as poisons and would be out of place here. I shall, therefore, in the present chapter speak only of some diseases induced by foods proper, which foods, being changed in quality or misapplied, are made the promoters of disease.

Eruptive Disease.

Now and then we see an acute eruptive disease called *nettle-rash*, or, technically, *urticaria*, accidentally induced by food. The disease is a passing fever attended with an eruption on the skin resembling closely the eruption produced by the sting of the nettle, with swelling of the eyelids and sometimes with swelling of the throat. As a rule, this disease is of a few days duration at most and of trifling moment, but I have known it terminate fatally from the extension of the inflammation into the throat and windpipe. The foods which induce this disease are limited : some kinds of fish, such as mullet and anchovy, induce it; mussels induce it; pork induces it, and I once knew it follow upon a hearty meal in which truffles had the same effect.

It is doubtful whether, in any of these examples of induced disease, the phenomena were solely dependent on the article of food. The evidence is all but demonstrative that the persons affected were specially disposed to the malady, and were therefore influenced by causes which in others, more happily circumstanced, would be inoperative. For example, the same kind of food which induces the phenomena in predisposed persons, may be partaken of from the same dish by other persons without injurious results. I have further observed that those who have been influenced by food, have been able to trace a tendency of an hereditary character to the same accidental injury. Some of these have also suffered more than once, in like manner, and have been conscious of their unfortunate proclivity.

Choleraic Disease. Siguatera.

In tropical climates a disease is sometimes induced by eating certain fishes which in temperate climates are harmless and nutritious articles of food. The perch, the gurnard, the flounder, the sparus, the goby, the sardine, and the two varieties of globe fishes called the diodon or two-toothed, and the tetradon or four-toothed are all at particular seasons noxious, within the tropics. The crews of vessels doing duty in tropical service are thus occasionally subjected to poisonous food from the fishes which are caught at various stations and are eaten as a change from the ordinary diet of the ship. The poisonous matter is actively developed in the digestive organs, in the spawn and in the liver of the fishes, and is most potent in those which have arrived at maturity of growth.

The Spanish colonists give the name of Siguatera to the symptoms of acute disease which result from the eating of poisonous fishes in hot climates. The phenomena of disease that are presented are of two kinds, gastro-enteric and nervous. The gastro-enteric form of disease begins with a severe attack of indigestion followed by great pain in the stomach, and by all the indications of gastro-enteric irritation, viz., nausea, vomiting, first of food then of mucus fluid, diarrhœa, coldness of the body, depression of the pulse and cramps. The nervous type of the disease is marked by sudden muscular prostration: the face of the sufferer becomes flushed and then pale; the pupils are contracted; the lips are swollen and blue; the pulse is weak, quick and intermittent; and very soon there is general convulsion with inability to exert any volitional power. Death quickly occurs unless skilled help be at hand.

Both these forms of the Siguatera are dangerous to life. Recovery from the gastro-enteric form is rapid when it commences, but the nervous type of the malady causes, for several days, extreme debility and irregular action of the heart. The poison, whatever may be its nature and composition, excites, it is clear, a most effective irritation of the pneumogastric nerves, an irritation as truly energetic as that which might be excited by submitting the nerves to the influence of a series of electrical discharges.

In this country we rarely see the phenomena of Siguatera. But occasionally, during the heat of summer the first or gastro-enteric form of the disease is produced by eating certain kinds of food that are easily decomposable. One of the most extreme examples of the gastro-enteric irritation that I have ever witnessed in London, was induced in a gentleman through partaking of lobster, during a time of almost tropical heat. The symptoms were identical with those which characterize the first order of the Siguatera. I have also many times recalled the fact that in the first fatal case of cholera which came under my notice in the year 1854, the patient affirmed, so long as she was able to speak, that the earliest symptoms occurred immediately after eating a lobster which, to her taste, had undergone a slight change as if from commencing decomposition. From the circumstance that Asiatic cholera was present in the metropolis at the time in question, the death of this lady was ascribed to the prevailing disease; but in all respects the disease from which she died resembled, in its symptoms, that second or nervous type of the tropical Siguatera which has been defined in a preceding paragraph.

In future studies of diseases of the choleraic type, and of the true or Asiatic cholera, it will repay observers to remember these facts respecting the influence of climate in modifying the physiological action of particular foods. It is possible that the poison of cholera may be developed in some foods,—or even in some waters containing much organic material,—through a specific decomposition of their organic matter excited by an external atmospheric condition which modifies the ordinary process of oxidation.

Septinous Disease.

There is a disgusting practice carried out by some epicures, that namely of eating decomposed animal food. Game allowed to become what is called high and venison allowed to become rotten are viands which minister to acquired depraved tastes. As a rule such foods do no serious harm to the body that receives them. In that wonderful alembic the stomach, not half of the functions of which are as yet discovered, the putrid matter is rendered innocuous, though it would be actively poisonous were it inserted into a wound or injected into a vein. This power of the stomach for digesting poisonous animal substances has long been recognized, and the famous Dr. Richard Mead, acting upon his knowledge on this subject, earned great repute in his day by venturing to swallow the poison of the viper and escaping without injury. The large majority of those who eat putrid flesh are protected by the same defensive action of the stomach. Their breath is tainted by the odour of the products of decomposition for some hours, and then the disagreeable result of the feasting is over.

There is nevertheless one possible source of danger from indulgence in the supposed luxury of eating decomposed food. It is occasionally the fact that the eater has a sore, abrasion, or wound of the mucous tract between the lips and the stomach. The food coming into contact with this surface and lying in contact with it yields up its poisonous matter direct to the blood and kills by the process of septinous poisoning, so called from *septine*, the organic poison defined at page 89.

I have, in my experience, met with one very striking instance of this kind. The person who was subjected to the poison, partook of jugged hare, the flesh of the hare having, prior to the cooking of it, been kept until it had become high. Beneath the tongue of the man was an abraded, ulcerated surface caused by friction from the stump of a broken tooth. Unfortunately a portion of the decomposed animal food was lodged in this ulcer, and within twenty-four hours symptoms of septinous poisoning, local and general, set in. The tongue was enormously swollen, the attendant fever which accompanies septinous disease was marked, and prostration succeeded. Gathering, from the history of the facts the possible cause of the malady, the offending matter was sought for and was removed from the place where it had been lodged. The removal, however, and all the care,—medical and surgical,—which I and one of my learned brethren, Dr. Edmunds, could bestow on the patient, proved unavailing. He succumbed in a few hours.

Parasitic Disease.

The researches of physicians during the past forty years have led to the knowledge that certain marked diseases, presumed in previous times to be derived from occult sources, have, in fact, their origin from animal foods. I allude now to a class of diseases called entozootic, diseases arising from the presence within the body of entozoa (ἐντος within; ζῶον an animal) or parasites, as they are more familiarly designated. The parasites giving rise to the maladies in question are numerous, and as yet are not all discovered. Those most commonly met with in practice here are: 1. The *Nematode* worms, including the *Trichina spiralis*, the *Ascaris lumbricoides* or common round intestinal worm, the *Oxyuris vermicularis* or thread worm, and very rarely, as an importation, the *Dracunculus medinensis* or Guinea worm. 2. The *Cestode* or tape worms, including the *Teniæ* or ordinary tape worms, and the *Cysticerci* or bladder-shaped worms,—*hydatids.* 3. The *Trematode* or fluke worms, including the *Fascicola hepatica* or liver fluke.

The trichinous flesh-worm disease, or *Trichiniasis*, has assumed in some countries the character of an epidemic, but in England we have learned its history, chiefly, from isolated examples of it. In order that the disease may be induced the trichinous parasite must enter the body by the alimentary canal. The human subject derives the larval trichinæ from the muscular flesh of some animal on which he has fed. The parasite as it exists in this flesh is in the larval state,—the state intermediate between the egg and the perfectly developed growth,—and in this condition it remains so long as it is imbedded in the flesh. Received into the stomach of a man, or of any other animal, it developes into maturity in a few days. The female trichinæ give forth their embryos in abundance, and the embryos at once make their migrations through the cellular connecting network which holds all the active and vascular organs of the body in close connexion.

In this country, disease from the presence of trichinæ in the tissues is very rare, and few English physicians have had opportunities of studying it. I have seen one portion only of a trichinous muscle derived from man, and in that case the existence of the parasite was not detected prior to death. On the continent there have been epidemics of Trichiniasis, attended, in extreme instances, with intense symptoms. When the trichinous disease occurs it is marked in its most developed form by three stages. (*a*) A stage of intestinal irritation, gastro-enteric,—corresponding with the period of full development of the trichinæ, and the evolution of embryos within the canal. (*b*) A stage of moderate fever, attended with pains in the muscles like those of rheumatism, and accompanied, in some few examples, with a red rash, and boils,—corresponding with the time when the embryos find their entrance into the muscles and are becoming encysted there. (*c*) A prolonged or chronic stage of impaired muscular movement with emaciation,—corresponding with the after period when the larvæ are entirely encysted in the muscle and are fixed in position. This last stage is not always well marked by symptoms. When the acute affection is over, and the parasite is duly lodged in its home, it happens usually, that the evidence of disease gradually ceases, and that the discovery of the presence of the foreign intruder is not discovered until after the death of the person into whose organism it has intruded. Such was the state of the body which presented the one single instance I have myself known of trichinous affection.

The trichinous parasite in its larval state enters the body, as we have seen, with infested animal food. There is no satisfactory evidence, however, that it ever becomes active when it enters after the food it infests has been subjected to perfect cooking and to subjection to the temperature of boiling water. This degree of heat, 212° Fahrenheit, probably destroys the life of the embryo, and the worst cases of disease have been those in which the sufferers have swallowed raw or imperfectly cooked infested flesh.

Nevertheless, the larvæ enjoy a tenacious life; they exist ready for development into the mature state, even when the flesh in which they are encysted has passed into decomposition. The flesh of the pig is the most frequent carrier of the trichinous larvæ to man.

Other nematode worms, two of which are well known, produce symptoms of disease in the human subject. The large round worm, the *Ascaris lumbricoides*, is one of these common parasites. It attains often a considerable size, resembling in its appearance the ordinary earthworm. It is developed and retained in the intestinal canal, and creates frequently extreme irritation, leading to convulsion and comatose sleep in children, and to that emaciation which almost invariably occurs when a body foreign to the alimentary surfaces is long in contact with them.

The small round worm, known as the thread or wire-worm, *Oxyuris vermicularis*, or *Ascaris vermicularis*, is another parasite which infests the lower part of the alimentary canal, and in children is a frequent source of extreme irritation. As a rule it infests children only, but the rule is not without its exceptions. At this time, in fact, I have under observation a middle-aged man who, throughout his life, has recurrently been tormented by this parasite. The symptoms it induces do not usually pass beyond those of local irritation, but occasionally there is extension of irritation, with phenomena of reflex muscular spasm.

The history of the migration of these nematodes, *Ascaris lumbricoides* and *Ascaris vermicularis*, is not so clearly defined as we could wish; but it is certain that by some article of food or drink the larvæ of the parasite enter the alimentary canal, after which entrance they develop there. It has been assumed that the introduction is through impure water, or by vegetable substances and fruits which carry water containing the larvæ.

Another nematode, the *Ascaris mystax*, has been discovered by Cobbold to be occasionally present in the alimentary canal of the human subject. The same patient and original observer, whose great work on the Entozoa does such honour to the English school of medicine, has also shown that the *Strongylus bronchialis*, a nematode allied closely to *Strongylus micrurus*,—the thread worm found often in abundance in the windpipe of the calf,—has been discovered in man. These parasites, when they are developed in the body, are also derived from food.

The phenomena of disease induced by the *Cestode*, or tape-worms, are all related to foods, and the relationship is singularly exhibitive of the success of scientific experimental research in its application to medical and sanitary science.

The cestode disease is due to the migration of the cestode worms, in one or other stages of their development, into and within the body of the infested animal. The tape-worm is the cestode with which the community is most familiar; but it is, in fact, one only of several phases of a distinct parasitic growth. It does not enter the body as tape-worm, but is derived from a larval form, which is present, usually in the encysted state, in the fleshy or visceral parts of animals that are consumed as food.

The commonest tape-worm in the human subject is the *Tænia solium*, a flat, ribbon-like worm, divided into numerous segments and reaching sometimes a length of many feet. The longest I have seen extended to sixty feet, but some observers have spoken of a length far exceeding even that. This worm is derived from the hydatid, known technically as the *Cysticercus cellulosæ*. The embryo of the cysticercus, swallowed accidentally by an animal which is to become human food, the *pig* for example, enters the alimentary canal, pierces the mucous surface, migrates along the cellular or connective tissue and becomes imbedded in the inter-muscular spaces. In this position the embryo undergoes development into *Cysticercus cellulosæ;* and so infesting the flesh of the animal, gives rise to that diseased condition of food commonly known as measly pork.

The measly food is the source of the tape-worm. By hooklets with which it is armed, the living cysticercus connects itself with the wall of the bowel of him who swallows it, and sprouting, as it were, from the attachment it has made, becomes the many segmented, long, flat tape-worm.

There is another side to this question of induced diseases from the cestodes. The imperfect *cestode* worms from which the tape-worms are developed are, in their turn, the cause of diseases which were characterized by the old writers as *hydatid* diseases, and which amongst the masses are still known by that general name. The hydatid disease originates from the tape-worm, and a simple illustration of the fact is derived from the history of parasitic disease in the inferior animals. The dog is commonly infested with the tape-worm called the *Tænia cœnurus.* The sheep is infested with an encysted hydatid, the *Cœnurus cerebralis*, which affects its brain, and gives rise to the disease called the "staggers," or "sturdy." If a sheep be fed with tænia from a dog the cœnurus will be produced in the brain of the sheep; and if a dog be fed with cœnurus from a sheep the tape-worm will occur in the intestine of the dog. Experimental researches have since proved that the two forms of disease can be thus reciprocally induced.

The illustration extends to the human subject.

A little tape-worm which is found in the dog and is called the *Tænia ecchinococcus* yields a larval form which is cystic,—the bladder-worm, or hydatid of man, *Ecchinococcus hominis.* In its embryonic state this parasite, introduced into the intestinal canal by food or water, permeates the tissues and becomes in time encysted in one or other of the vital organs. The liver is the organ most frequently attacked, but no organ actually is free from invasion. The embryo in due course becomes developed into an easily recognizable animal form enclosed in its cyst. It has a true head with a double crown of hooklets, four suckers and a body charged with calcareous particles. Through what precise articles of food the embryo of the ecchinococcus is introduced is not yet completely known; but the experimental evidence of introduction by alimentary substances is demonstrative.

The phenomena of disease caused by the cestodes are many and important. The tape-worm is a source of constant irritation, and in all cases the knowledge of its existence in the body causes depression of spirits and excitability.

The most dangerous forms of disease from parasites are those which follow the insertion and development of the true hydatid, the ecchinococcus, in the tissues and vital organs. The ecchinococcus, as if it had a roving commission, plants itself in the most various and important viscera. The brain, the spinal cord, the eyeball, the lungs, the liver, the intestinal glands, the kidney, the urinary bladder, the muscles and even the cavernous portions of bone itself are homes in which it may live. In consultation with the late Dr. Herbert Barker, of Bedford, I saw a man who threw off the ecchinococcus in large numbers, by the renal secretion, and we traced in this instance pretty clearly the mode in which the larvæ of the special tænia had entered the man. He had for many years subsisted almost altogether on fresh pork, in so far as animal food was concerned, and twice weekly had feasted on pig's fry, a dish made up of fragments of the intestinal part of the swine. On some one of these many feasts he had, by accident, partaken of a fry containing an embryonic parasite which the swine, during its life, had picked up while feeding, and which had come from the tape-worm of a dog.

Disease in the human subject from the third order of parasites to which I have adverted, viz. the *Trematode*, or fluke worms, is very rare. In the sheep, the liver fluke, *Fascicola hepatica*, is, as is too well known, a cause of most serious and extensive disease. This parasite has, in a few instances,—not ten probably altogether—been found in the human body; but by some happy accident or necessity man has, up to this time of his history, missed the food that conveys this fatal enemy.

One more fact is worthy of attention. In proof of the scientific revelations that have been made of late years respecting the origin of parasitic diseases from the consumption of infested foods we have the evidence that in particular communities feeding on particular infested foods the parasitic diseases prevail. I found in the great pork-devouring town of Wolverhampton that tape-worm was one of the most common affections. In Iceland, where there are six dogs to one peasant, and where the native quacks,—innocently following the *similia similibus* art of cure,—actually administer dog's fresh excrement as a medicine for the treatment and, as they believe, the cure, of hydatid disease, there are no fewer than 10,000 persons suffering from the *morbus ecchinococci.*

Saline Purpura, or Scurvy.

A peculiar disease is induced by the excessive use of saline substances as food, that is by the employment of salted foods in too great an excess. Our seafaring men, as is well known, have suffered severely from this form of induced disease, to which the name of scurvy has been applied. I have occasionally seen, in ordinary practice, a similar condition induced by the persistent recourse to salted animal flesh, especially to salted bacon. The physical change induced, consists of a modification in the state of the blood. The specific weight of the blood is unduly increased, the plastic constituents of the blood are held in too extreme a state of solubility, and the corpuscles are reduced in size and made irregular at their edges. The effect of these changes is to render the blood so fluid that it pours out of a wound or into the soft tissues with unnatural readiness. From such parts as the gums the blood exudes freely: it infiltrates into the skin, causing dark vascular blotches, purpuric spots, and sometimes from a wounded surface or even a weakened vascular surface it flows so freely that danger of death from the loss of it becomes imminent. In addition to these changes in the blood there follow indirect modifications in other organs, owing to the readiness with which, in its unnatural saline condition, it attracts and condenses water. The nervous centres suffer in consequence, and extreme prostration is the result. To this disease I have given the name of *saline* purpura, in order to distinguish it from other forms of purpura which arise from entirely different causes. There have been periods in the history of our country, during which saline purpuric disease has been very prevalent. Happily, with the introduction of ampler and better supplies of food for the people, it is now ceasing to be a common malady,

Tetanoid Fever.

There occurs now and then in our modern life an acute and dangerous disease to which the names of cerebro-spinal meningitis, epidemic meningitis, and spotted fever have been applied, but which is now more correctly designated, by Dr. Rodenstein, *Tetanoid fever*. The disease is rarely seen in England in the present day. I have recorded one isolated case of it, and between eight and nine years ago an epidemic of it, happily unattended by fatal results, broke out at a village called Bardney, in Lincolnshire. In other countries the malady has been more prevalent. In France and in Ireland it has broken out many times, but mainly amongst troops that were lying in garrison. It has prevailed at various periods in Northern Germany, and in America it has assumed such formidable proportions, that in the year 1873, in the state of Massachusetts, no fewer than 747 persons, viz.: 393 males, and 354 females, died of it. The disease, as its names imply, and as its latest name specially implies, is a nervous fever attended with tetanic spasms. At its commencement there is a rigor or chill, a burning pain referred to the spine, with a fever rarely very high, and a wild expression of the eyes.

After a time there is squinting with convulsion and tetanus, an eruption on the skin, sometimes diarrhœa, and, in the worst cases, coldness of the surface of the body and rapid death.

In writing on the nature and causes of cerebro-spinal meningitis in the year 1865, I ventured to draw the conclusion from the facts I was able to gather together, that this formidable malady is induced by the eating of vegetable substances, viz. of bread stuffs containing diseased grain, like spurred or ergoted grain, or a similar vegetable poison present in what is called *must* of grain. In a report, made this year to the State Board of Health of Michigan, on an epidemic of Tetanoid Fever in Munroe and Lenawee counties, Dr. Henry B. Baker, Secretary to the Board, has brought together the most extended series of facts that have as yet been collected respecting the malady. A careful analysis of his report, in which nothing is preconceived and much is left open for independent judgment, leads, I think, to the conclusion that under favouring conditions for its action, diseased grain, received as vegetable food, is the primary cause of the phenomena which characterize the disease.

Functional Nervous Derangements.

Some functional nervous derangements are excited by fluids commonly consumed with, or as foods. *Tea* taken in excess is one of these disturbing agents. Tea exerts an astringent action, and by the presence in it of an organic substance, *theine*, it exercises a special influence over the nervous system, which, to say the least, is temporarily injurious. I believe the effects from tea are more severely felt by the young, and that as middle age approaches, they are less severe.

The symptoms which indicate the injurious action of this article of food are sufficiently characteristic. They are, intensely severe headaches, constipation of the bowels with what is usually considered to be deficiency of bilious secretion, flatulency, an unsteadiness and feebleness of muscular power, and, not unfrequently, a lowness of spirits amounting to hypochondriacal despondency. In children under the influence of tea this lowness of spirits is often very severe, so severe that the occurrence of the simplest natural phenomena, as the approach of darkness, the cast of a large shadow, or the spreading over the sky of dark clouds, are sufficient to create dismay and fear.

In poverty-stricken districts, amongst the women who take tea at every meal, this extremely nervous semi-hysterical condition from the action of tea is all but universal. In London and other fashionable centres in which the custom of tea-drinking in the afternoon has lately been revived under the old name of "the drum," these same nervous symptoms have been developed in the richer classes of society, who, unfortunately, too often seek to counteract the mischief by resorting to alcoholic stimulants. Thus one evil breeds another that is worse.

The flatulency induced by tea taken late in the evening has the effect of interfering with the process of sleep: it prevents or disturbs sleep by dreams and muscular startings, and is a common cause of that peculiarly painful symptom known as nightmare.

The extremely injurious effects of tea are best seen in some of those who are charged with the commercial duty of what is called "*tea-tasting.*" A professed "tea-taster" who was so seriously affected by the process that he thought it proper to consult me on the symptoms induced, defined the symptoms very clearly as follows: "Deficiency of saliva; destruction of taste for food; biliousness; nausea; constipation; an extreme and undefinable nervousness; and nightmare whenever sleep is obtained." The same phenomena were presented in another gentleman similarly circumstanced. They disappear in a few weeks, when the process of "tea-tasting" is stopped altogether, and I believe they leave no serious mischief in their train.

The symptoms from which habitual tea-drinkers suffer are identical in character, but minor in degree.

Coffee, though less injurious than tea, is, even in slight excess, a source of derangement of nervous action. Its effect is to relax the minute vascular network and increase glandular secretion. For this reason it acts on most persons as a diuretic, while on some it acts as a purgative. Its influence is exerted through the agency of its organic base, *caffeine*. Coffee, like tea, induces dyspepsia, and perhaps, with even more activity than tea, it keeps the brain awake when that wearied organ ought, according to nature, to be asleep. It is nevertheless a better beverage than tea, for the simple reason that it is not an astringent, does not, like tea, suppress the secretion of the kidney, and does not lead to mental depression and nervous irritability.

Acidity from Food.

Foods which are unduly acid or which are passing through fermentative stages often become a source of mischief by causing excess of acid in the alimentary canal and absorption of acid from the alimentary surface into the tissues. Too free indulgence in lemonades and other waters artificially acidified leads to harm, as does indulgence in new bread, preserved fruits, unripe cheese, and almost all sweetmeats. In persons who are naturally disposed to acidity, even a slight excess in the use of these luxuries is sufficient to create a great deal of mischief that is more than transitory.

The phenomena of disorder produced by these substances are flatulency and distention of the stomach, with the other usual symptoms of indigestion. These are followed by deranged secretions, by excess of acid secretion from the skin, and frequently by aches and pains called, vaguely, rheumatic, neuralgiac, or gouty, and partaking truly of these characters of pain according to the proclivities of the individual who suffers from them.

Some minor evils are induced in the stomach by the practice, now so common, of indulging in effervescing drinks, such as ginger-beer, soda-water, and seltzer. In moderation these fluids are refreshing and harmless drinks; but, often imbibed, they create fulness, from the free liberation of gas from them within the stomach, and that deficiency of stomachic tone which invariably follows undue and prolonged tension on the muscular structure of the digestive organs.

Irritation from Indigestibles.

In the hurry and thoughtlessness of eating it is a common practice to swallow substances with food which, as a little experience tells every one, are not digested. The husks and stones of fruits, the rinds of vegetables, the elastic tissues of animals, and all hard dried fruits and meats are included in the parts of food over which the digestive fluids exert an imperfect solvent power.

It is probably the rule that the indigestible substances alluded to produce nothing more serious than a temporary indigestion, a little stomachic pain, and some hours of uneasy sleep. But occasionally worse effects than these follow the irritation induced. One of the most extreme convulsive attacks I have ever seen to be followed by recovery was brought on in a youth by the presence in his stomach of a portion of the peel or rind of a potato. On the removal of this irritating substance the convulsion instantly ceased.

I was consulted by the late Mr. Davis, of Llansillan, in another and similar instance of severe convulsive, and, as it seemed, epileptic seizures occurring in an adult man. The convulsions suddenly ceased upon the rejection of what proved to be the coronary arterial vessels from the heart of an ox. The anatomical character of the vessels showed that they were derived from the heart of a domestic animal, and the patient, when the fact was made known to him, remembered that his first attack followed the partaking of a hearty dinner, of which the heart of an ox formed the *pièce de résistance*. In young children the irritation of stomach produced by the indigestible foods with which they too often are indulged, is occasionally a cause of death. The irritation reflected to the nervous centres, from which the muscles of the larynx are governed, leads to spasm of the glottis, to what is called spasmodic croup and to suffocation.

Perversions of Nutrition from Improperly-Selected Food.

Food requisite for the proper sustainment of the body must have four essentials. (*a*) Colloidal substance for maintaining the true fleshy, membranous and nervous parts,—actual structural food. (*b*) Combustible substances for maintaining the animal heat,—force yielding food. (*c*) Mineral substance for the maintenance of the solid and passive moving organs,—skeleton food. (*d*) A fluid menstruum for conducting all these constituents to their respective destinations, and for connecting them together.

The solid constituents of food are represented to us in their purest and most natural form in corn in which they exist as glutin for building; as starch for combustion; and as phosphatic salts for skeleton food. The fluid menstruum is simply and naturally presented to us in pure water.

I have already touched on some of the many evils which spring from additions to these bases of food. There are others which spring either from an irregular supply from a deficiency, or from an excess of the bases themselves.

The proportions which the basic parts should bear to each other in natural foods is taught to us by nature herself in milk. In that aliment, from its human source, the colloidal matter is present in the proportion of three, the combustible of six, the salts of one, and the water of ninety per cent.

If in a supply of food there be a large excess of the colloidal part a perversion of nutrition is established. The moving colloidal organs, such as the heart, become increased in size, and if the voluntary muscles be not exercised so as to use up the surplus, there is perverted chemical action within the body. The nitrogenized material, of which the colloidal structures are formed, is decomposed with unnatural excess of product and a tax is put on the excreting organs, on the kidneys especially, to remove the excess. Thus occur those copious deposits in the renal secretion which invariably mark either the too abundant consumption of animal flesh or the deficiency of outdoor exercise.

If the amount of colloidal food be unduly reduced, and the body be too exclusively fed on the combustible bases, there follows, as the ordinary course, an excessive development of fatty matter in the body. The combustible substance, present in a degree beyond what the body can burn and dispose of in production of force, is laid aside between the large muscular masses, or in extreme examples, between the fasciculi of muscles, and, in extremest examples, between or in the place of the ultimate elements of which the muscle is composed. Thus we have disease induced by fatty changes, varying in degree from simple obesity to muscular inactivity and to fatty muscular degeneration, in which last change the heart shares more readily than less vital muscular organs. These modifications of the animal tissues from accumulation of fat are induced specially, in our modern life, amongst the female sex by their habit of subsisting largely on such foods as bread and butter, pastries, and fluids richly charged with sugar.

If the colloidal or structural foods be withdrawn altogether, as sometimes occurs in the straits of famine, and the body be left to be sustained on starchy foods alone, there is established a febrile condition with emaciation, to which condition the name of "*famine fever*" has been applied. This disease may become epidemic, as it did in the great outbreak of Irish fever twenty-nine years ago; but in our daily life we see it most frequently in the isolated form, in the starving children of the neglected poor, the children that are fed, all but exclusively, on potatoes, rice, arrowroot and other similar foods, to the mockery of natural law.

If the inorganic saline substance,—the skeleton food,—be withheld, as it is withheld when bread and juice of animal flesh are replaced almost altogether by the starchy foods, then not only is the febrile state established, but the earthy support to the skeleton is insufficiently supplied. The firm-set bone is not duly formed and the pliant shadow of it, in the flexible, weak, organic outline of gelatine, is unable to offer resistance or to support weight. In this way is artificially constructed the little helpless limb-bowed, spine-bent, chest-deformed, thin-skulled child, who grows into manhood with all the impediments, mental as well as physical, which result from organic deformity.

The effect of reduction of the natural amount of water in food is rarely seen, except in instances of persons who have suffered shipwreck, or who have died while travelling over some arid desert; but the effect of excess of water in or with food is a common phenomenon. The majority of persons in our modern life indulge too freely in drinks of which water is, of necessity, the staple.

The signs of laxity of muscular fibre, of thinness of the blood, of pallor of the face and of nervous excitability with deficiency of power, which mark many of our women, are often due to the consumption of an excess of liquid food. Much more serious, however, is the error committed by bloated men who, in beer and other alcoholic beverages, swallow many pounds of liquid daily. These men, their tissues distended with fluid and their blood-vessels at extreme tension, fall ready victims to any and every change that tends to produce congestion of blood in vital organs. They rapidly become dropsical, if excretion of fluid from their bodies is impeded, and so tensely are their vessels engorged that they can bear no extra pressure without danger of exudation of fluid into some vascular structure or of rupture of vessel under an extra pressure of the labouring heart.

In the opening passages of this chapter it was observed that disease from pure gluttony is not of common occurrence in our modern life. I must not, for all that, omit to indicate that the majority of well-to-do people, in ignorance of the consequences, take too much daily food, that is to say, live too well. Adult middle-aged English men and women, who may be accepted as the types of moderate people comfortably provided for, take, on an average, twelve ounces of mixed solid food for breakfast, twelve ounces for midday meal or luncheon, and from twenty to thirty ounces for their late modern dinner or ancient supper. A total of from forty-five to fifty ounces of solid sustenance is in fact taken, to which is added from fifty to sixty ounces of fluid in the way of tea, coffee, water, beer, wine. The excess is at least double the amount required for the sustainment of the hardest mental and bodily labour.

The quantity of food and drink noticed in the estimate given immediately above as that taken by the so-called moderate persons is trifling when compared with that which the immoderate consume. There are numbers who far exceed the amount stated, and who are subject to more serious symptoms than temporary inertia and obesity. Their digestive organs assume a large size. They suffer from varied symptoms of permanent dyspepsia, such as constipation with occasional attacks of loss of blood from the bowels, or hæmorrhoids, or eruptions on the skin, or pains in the stomach, or irritation and even ulceration of the mucous lining of the stomach with inability to undertake any prolonged active labour. In them an actual disease is at last established, which ends, usually, in fatty degeneration of the heart, and in death from that cause.

I was once consulted in respect to the symptoms with which the idle inmates of a large and wealthy establishment suffered. I was told that an affection very much like dysentery had become developed and was unusually obstinate of cure. The water supply of the establishment, the drainage, the ventilation, had, all in turn, been blamed and altered, to no effect. I found the unfortunate sufferers were sitting down regularly to four heavy meals a day, with animal food at each meal, that they took between meals no exercise adequate for utilizing a tithe of the potential energy that was stowed up in their tightly-packed organisms. This one fact seemed to me sufficient to account for the phenomena, and the instant relief that followed the cruel prescription of "double the work and halve the food," was proof direct that the cause of the malady was found, for the process of cure was immediate.

Some indirect evils have been traced to fashionably moderate and immoderate indulgence in food. Mr. Roberton of Manchester first pointed out, and his wide experience has since been confirmed by many who have had the same opportunities of tracing the same truth, that the accidents which befall overfed women during and after childbirth are infinitely more serious and fatal than are the same kinds of accidents in women who are moderately and indeed scantily fed. There is some evidence, moreover, in favour of the suspicion that the disease cancer is on the increase in proportion with the increased consumption of food by individuals of the richer and luxurious classes. On this point it is, however, necessary to wait for more light before a decisive opinion can be offered.

CHAPTER XV.

DISEASE FROM IMPURITY OF AIR.

IMPURE air, the specific cause of some diseases, is the disposing cause of many; that is to say, it is the medium by which agents and influences giving rise to disease are carried to and into the body. The air may be artificially so charged as to be the bearer of any and every vaporous or gaseous poison diffusible through it. It may waft fine, solid, poisonous particles, so that they are borne into the lungs or on to the outer surfaces of the body. The water vapour with which it is charged may bear soluble poisonous substances. Thus the air may become one of the most common and ready mediums of the factors of disease; but practically the substances, vaporous, solid, or fluid, which it conveys are comparatively few. The diffusion of all diffusible matters through air is so rapid and so wide-spread, and the oxidation of organic substances in it is so effective, that it must be imprisoned as well as empoisoned or deteriorated before it can exert a dangerous influence.

Impurity from accumulation of products of respiration and excretion.

If the air be surcharged with the products of respiration, even in a small degree, it becomes oppressive and injurious. It has been held that the impregnation of air with so little as one per cent. of that product of respiration carbonic acid is sufficient to induce symptoms of disease; but the evidence on this point is, I have reason to think, doubtful. I found, however, by direct experiment, that so soon as a charge of over one per cent. of this gas was introduced painful and distressing phenomena were soon presented. They included frontal headache, dizziness, sense of nausea, a feeling of drowsiness, and at last faintness. Carried to an extreme, they would end in insensibility, convulsion, and, in the extremest degree of all, in death.

In a small close room we frequently feel the effects of carbonic acid in some of the symptoms above described, but I do not know of any actual disease from this cause to which a precise name could be given. When persons are for long hours and day after day confined in this kind of bad air, with nothing more than accidental ventilation or change of place to relieve the influence and prevent actual danger, oppression, dull headache, impaired appetite, weakened digestion and deranged secretion are the results. In the healthily constitutioned body these symptoms readily pass away on exposure to pure outdoor air, but they who are disposed by hereditary tendency to disease are not so easily let off. The consumptive are specially injured, and many of the most intensely developed examples of pulmonary consumption are induced in this manner.

Persons of plethoric and of rheumatoid or gouty proclivity are disposed to their special diseases by exposure for long periods of time to an air so charged with carbonic acid as to induce the symptoms to which I at first alluded. But I must speak with much caution on this point, since many other disposing causes have to be taken into consideration, I mean such causes as deficient exercise, indulgence in alcohol, excess of food and over-mental work. Still, the impression is on my mind that, in a few instances, I have seen the symptoms induced purely in the manner described; and, what is more to the purpose, I think I have seen a cessation of them follow the prescription of freer and purer air.

When in a confined room a number of persons are long inclosed together, other excreted matter than the carbonic acid collects in the confined atmosphere. There is given off by the breath, as was discovered first by the late Rev. J B. Reade, F.R.S., and afterwards and independently by myself, a minute trace of ammonia. This trace is so minute, it is not appreciated except under extreme circumstances; but when the circumstances are extreme, the added product is not only felt, but is felt prejudicially. The unfortunates who were shut up in the Black Hole of Calcutta were painfully conscious of this fact. The historian of that awful tragedy, himself one of the sufferers, tells us that the intensity of the suffering was produced by the intolerable irritation caused by the inspired air. The sensation was as though the face were held over a vessel of hartshorn. The difficulty of respiration commenced within an hour after the living interment of the hundred and forty-six persons immured, and in two hours fifty were dead. In the morning twenty-three only remained alive, and nearly the whole of these suffered afterwards from what was called putrid typhus, and of which many died.

The action of simple ammonia on the body is that of an irritant, and it tends to hold the blood in a state of fluidity. It also interferes with the process of oxidation of organic matter, so that it becomes an antiseptic, and it rapidly decomposes that allotropic condition of oxygen which is called ozone. Thus ammonia present in the atmosphere daily respired by living beings is injurious, and we see its effects in the pallor and feebleness of many who dwell in homes in the air of which ammonia is always present; homes over stables, for example, or in close proximity to decomposing organic refuse.

From diseased animal bodies there may be an elimination of compounds of ammonia which are actively dangerous. In the wards of cholera hospitals, the air has been found charged with sulphide of ammonium; in fever wards, and in the close wards of workhouses, the same compound has been discovered; and indeed, to come to more direct evidence; this gas is exhaled by every one who has fœtor of the breath.

The sulphur compounds of ammonia have an action markedly different from simple ammonia. I found by experiment that they induce symptoms of a disease resembling typhus.

In addition to ammonia-sulphur compounds, there are other representatives of the sulphur series which emanate from the body by the breath and skin. The volatile emanation from the breath which is noticeable after eating garlic or onions is due to a volatile sulphur compound; and in the breaths of persons who are saturated with alcohol, a peculiarly poisonous substance called mercaptan, or sulphur-alcohol, may be distinguished by its specific odour.

More rapidly-acting agents of an organic kind, which the hand of the chemist has never yet isolated and which the microscopist has failed to reach or fix for sight, probably emanate with the animal volatile excretions, and are borne by the air from the diseased to the healthy. Without entering on debateable ground it is sufficient to know the broad facts that confined air becomes definitely poisonous and disease-producing, and that, charged with the emanations of those who are worst fed and most exhausted by work or by disease, it gains in intensity of power for the production of disease.

Impurity from Organic Poisons.

Air may be rendered impure by the presence in it of portions of organic poisonous matter which, though minute in the extreme, so that they defy definition, are probably solid bodies, and are merely borne in the air, mechanically, for a short distance. These small organic particles are nevertheless sources of irritation and of local disease when they alight on structures of the body which are receptive of and impressionable to them. In this manner the contagious inflammation of the eyes called contagious ophthalmia is communicated and diffused from one person to another in the close ward, school-room, or barrack. Other particles of organic kind, and carried in a similar way, are productive of certain cutaneous contagious diseases.

I was severely criticized some years ago for energetically reporting in respect to a large country workhouse, in which the children were all ill and in which ophthalmia, ringworm, eczematous eruptions, sore-throats, and other kindred ailments of the skin and mucous membranes were persistently breaking out, that the whole of the mischiefs were due to the polluted air of the schoolroom. But the criticism affected the fact just as little as it did me, and I was rejoiced to discover, that, when the anger that was excited had passed away and the improvements I suggested had been carried out, the diseases ceased, and the general health and strength of all the children improved forthwith.

It has been assumed by some that the fatal disease consumption is contagious, and that the poison of it, a presumed organic substance, can be conveyed by the air from one person to another. I have never been able to see the proof of this theory in the arguments adduced in support of it, but I am satisfied, that by living in a close and ill-ventilated room, and that especially by sleeping in such a room, the disease can readily be induced in those who are predisposed to it, and may *possibly* be induced in those who stand clear of hereditary taint. The lessons that were learned in our London barracks, a few years ago, afforded striking evidence on this subject, for there the measure of the evil was determined by the measure of space allotted to the soldier.

I had one instance in my own hospital practice which even more pointedly illustrates the same truth. A man, by business a hawker, a "Cheap Jack," who was accustomed to live, with some other members of his family, in the van in which he travelled from fair to fair and from which he sold his wares, was brought to me in the third stage of pulmonary consumption. He soon succumbed to the disease, and was succeeded in business by his brother, who followed precisely the same line of life and lived in the same van. The brother also became consumptive and died. He, in turn, was succeeded by his sister's husband, who shared the same fate, and, not to extend the narrative to an undue length, in the course of seven years I had before me no fewer than nine victims of the fatal pulmonary disease, in every one of whom it originated in that particular travelling van. It was in vain I protested to those affected against continuing to live under conditions so favourable to disease. They argued that they were constantly in the open air by day, that they got regular change of air, that they were not exposed to wet, and that at night they were very snug; in fact, they would not believe that the sleeping in the van-house had anything whatever to do with the disease. For aught I know that van may still be going its fatal rounds, and I fear it is not worse fated than other similar vans, for in these moving close habitations consumption is the rife destroyer. The gipsy lying out in his tent becomes rheumatical and gets acute maladies of an inflammatory kind, but he does not get consumption like the hawker. His canvas tent is ventilated; the wooden travelling house of his equally nomadic neighbour is a close, foul box, in which the deathly disease is generated as it might be in an experimental research on a lower animal.

It may be inferred from the instance I have supplied that there was proof of the conveyance of contagion. The evidence, however, is not perfect in many details. The first sufferer had bought the new van and first occupied it; he, therefore, did not get the disease by the process of continuation; the van was afterwards regularly emptied, cleaned, newly painted and exposed to the air, so that the probabilities of the continuance in it of specific communicable poison are most remote.

The practical truth is none the less valuable that the disease originated so many times under the same conditions; and it is this truth, in its simple significance, that I wish to leave on the mind.

Impurity of air by deterioration.

Air used for the purposes of respiration may be rendered impure by a process not as yet fully understood, a process of deterioration which I have described briefly in pages 65 and 66. The scientific hypothesis in explanation of this change will be, that the oxygen of the air has lost its activity and has become ant-ozonized. I shall not contend this hypothesis, but merely state the plain facts, which are, that the oxygen of the air by which the natural life is sustained, if it be breathed over and over again, though it be freed from carbonic acid and other known products derived from breathing, and though it be seemingly perfect in regard to its quality and its power of supporting the combustion of flame, is still incapable of sustaining the perfect animal existence.

The practical inference we gather from these observations is, that when in closed rooms, impure dwellings and crowded assemblies we feel or see the depression and pallor and faintness which, with more or less of intensity and for longer or shorter time, prevails, there is more at work than the presence of the products of excretion; that the supporter of combustion, the oxygen itself, is undergoing some physical change of condition under which it is losing its special faculty and is becoming, by negation, an indirect poisonous agent.

Devitalized air finds its entrance into human habitations. It is this air in our overcrowded towns and cities, where there is no vegetation to revivify it, which we distinguish as something so different from the fresh country air that streams over meadow and forest. It is the breathing of this air that makes the child of the close town so pale and lax and feeble, as compared with the child of the country. It is this air that renders the atmosphere of the crowded hospital so deficient in sustaining power. It is this air that gives to many of our public institutions, in which large numbers of our poorer ill-clad uncleansed masses are herded together, that "poor smell," as it is called, which is so depressing both to the senses and to the animal power.

In many private houses, houses even of the well-to-do and wealthy, streams of devitalized air are nursed with the utmost care. There is the lumber room of the house in which all kinds of incongruous things are huddled away and excluded from light and fresh air. There are dark under-stair closets in which cast-off clothes, charged with organic débris of the body, are let rest for days or even weeks together. There are bedrooms overstocked with furniture, the floors covered with heavy carpets in which are collected pounds upon pounds of organic dust. There are dressing-rooms in which are stowed away old shoes and well-packed drawers of well-worn clothing. There are dining-rooms in which the odour of the latest meal is never absent and from the sideboard cupboards of which the smell of decomposing fruit or cheese is always emanating. There are drawing-rooms in which the scent of decayed roses, or of the varnish from the furniture, or of the dye from the table-covers is always present. There are kitchens in which there is the odorous indication of perpetual cooking. There are sculleries where the process of "washing up" seems to be in permanent action, and where the products of change from stored bones, potato parings, recent vegetable green food and other similar refuse, are abiding. There are water-closets in which there is at every time of day and night a persistent, faint ammoniacal organic odour.

The process of devitalization of the air is again effected, locally, in human habitations by the presence in it of the lower forms of life. When in the dwelling-house dogs, cats, tame mice, birds, squirrels, are kept in such numbers that the odours of the animals are perceptible; when flies cover the ceilings, and a mould collects on the walls; then the air teems with myriads of minute living forms and with organic dust. Every particle of this matter induces deterioration of the air that feeds the lungs.

I have omitted, in the description of the house, the air of which is devitalized by the household causes specified, to speak of the accident of an open drain within the building. I have been supposing a house well drained, and to ordinary appearance clean, wholesome, and comfortable.

Under the conditions here named, wherever they exist, the air is devitalized: it is actively employed at every moment in destroying the organic matters which ought never to be there, and for hours of the night while literally locked up, it is inspired and expired over and over again by the unconscious sleepers, who vitiate it the more. Under such conditions thousands of families live, children grow up and old people die. They may all go for years and suffer no acute disease, and those of the family whose duty calls them daily into the open air may even be healthy; but those who have to remain nearly all day in the devitalized atmosphere of the home show the fact in paleness of face, languor of limb, persistent sense of weariness, and dulness of spirit. Under such conditions acute disease, epidemic fever, or other actively dangerous malady need not occur unless it be introduced from without; but the home is ready for it if it be introduced. The conservatory is in the perfect condition for receiving the poisonous particle, and the persons exposed to the poison are in a state of preparation to be stricken by it.

The physician who enters a plague-invaded house, and who looks to the surroundings of his patient, is guided largely in estimating the chances of recovery or of death, by his detection of the absence or presence of devitalized air.

It may be that under great atmospheric variations large tracts of the aërial sea itself may undergo some similar change of physical condition and that a general may usurp, to a considerable extent, a local condition. There is something in the symptoms produced by certain winds,—the east wind notably,—something in the depression and deficiency of nervous and muscular power which closely resembles the class of phenomena induced by deteriorated oxygen; but, as yet, we have no method by which to detect a physical change of the atmospheric oxygen; leading to the phenomena. Our meteorological labourers have ample room for work in seeking a test for determining the sustaining value of the air we breathe.

Impurity from sewer emanations.

When emanations from a sewer or cesspool enter a house, phenomena of disease, much more decided and acute than those described in the last section, are apt to be presented amongst the inmates. The researches of the late Dr. Herbert Barker, in which I had an opportunity of taking part, have taught the nature and quality of ordinary cesspool and sewer air, and the effect of such air on animal life. They have shown that cesspool emanations, when they are steadily inhaled, are poisonous, the symptoms of disease induced being those of intestinal derangement followed by prostration, increased temperature of the body, distaste for food, and those general signs which mark the milder forms of continued fever common to the dirty, ill-ventilated homes of the lower classes of the community. Pursuing these researches into an analysis of the poisonous quality of sewer air, Barker discovered that the emanations were compounded of several gases, but that the true disease-producing agent was sulphuretted hydrogen gas. This gas diffused in breathing air in the proportion of 0·056 per cent.—in which dilution it is, after a time, indefinable by the sense of smell,—was sufficient even in such minute distribution to induce diarrhœa, rapid pulse, heat of the surface of the body succeeded by coldness, tremors of the muscles, and all the worst symptoms that follow the inhalation of sewer air.

In these days of improved drainage and advancing sanitary science we see less frequently than formerly the continued fever from sewer air which affects the human subject. But the fever is still prevalent in our badly-drained villages and towns, and in close, overcrowded localities where the cesspool and unflushed sewer still abide. Where the drain-trap is as yet unknown the sewer air even now finds its many victims.

Sewer air may become the bearer of those poisons, of the spreading or communicable diseases, which are volatile and easily diffusible. Some think typhoid fever and cholera may be communicated in this manner; but I must candidly admit that, in all my own inquiries on these diseases and on this mode of communication, I have not been able to satisfy myself that the poison was actually conveyed by the air and was actually absorbed in the process of respiration. Most frequently sewer emanation, charged with the specific poison of the said communicable diseases, is carried into the water cistern, into milk, or into some other article that is partaken of as food or drink.

Typhus fever, scarlet fever, small-pox, are dependent for their existence on poisons which are much more readily transmissible by suspension in sewer air, and are more liable to be introduced into the body by the breathing organs. With considerable reserve I may express the opinion that I have known these diseases communicated by sewer air; but the disease, *par excellence*, derived from the sewer is that continued fever which is induced by the natural atmosphere of the sewer, by the inorganic products of organic decomposition, of which sulphuretted hydrogen plays the leading part.

Impurity from heated stoves.

The air of living rooms is occasionally rendered impure by the use of cast-iron stoves in which a moderate amount of fuel yields, in combustion, a considerable degree of heat. The heat radiates from the stove freely and the air of the room is quickly warmed throughout. The air is, however, by this means, rendered dry and singularly oppressive, as if there emanated from the cast-iron some product which was injurious to the process of respiration.

A gentleman I once knew, whose lungs were free of tubercle and who had no taint of consumption in his family, was constantly harassed by attacks of hacking cough, with spitting of blood. There was much difficulty in accounting for these symptoms. At last it was detected that his attacks always came on when he was at work in his study, into which apartment, under the idea of making it warm and comfortable, he had introduced a large Burton stove. To a stranger entering that room, when the doors and windows were closed and the stove was in action, the heat and dryness of the atmosphere were at once oppressive; but the student, from constantly occupying the room had become accustomed to it, in regard to his sensations, and did not trace that the symptoms which alarmed him sprang from the condition of the air he was breathing. Made conversant with the possible cause of his malady the stove was abandoned and an open firegrate, that had been closed up, was once more brought into requisition. The cough and expectoration of blood thereupon disappeared immediately. A few weeks later, thinking that after all the stove and the cough might be mere coincidences and that the removal of the cough was possibly due to some other cause than the removal of the stove, our student had the stove replaced and used as before. The cough and the more serious attendant symptom directly recurred, but were once again removed by the return to the process of heating the room from the firegrate.

The above is one out of many instances of a similar kind. It is sufficiently typical to stand alone in the form of a simple illustration of a singularly simple mode of inducing disease.

Impurity from damp.

Diseases of the most serious character, such as pulmonary consumption and rheumatism, are induced by air rendered impure by damp, that is to say, by the persistent saturation of air with water in a state of vapour. For this reason the act of living in new houses that have not been thoroughly dried, and the walls of which fail to hold the paper which is hung upon them, is often attended with the most terrible results. I visited a new and pretty row of houses in a London suburb four years ago to attend a young lady who was suffering from the early stage of tubercular consumption. She had been recently married and her house, newly furnished and exhibiting in the drawing-rooms bridal presents still in their original beauty, looked the very picture of prettiness and comfort. But its walls were reeking from moisture and the mirrors were obscured with condensed vapour. I pointed out the danger and suggested the removal of the patient from the house. The suggestion, as soon as it could be, was carried out but too late to be of any avail, for the young lady succumbed to the malady with which she was stricken and her husband, who had also become affected in a similar way and from the same cause, quickly followed her. On inquiry I found that in the same row of pretty houses, twenty in number, there occurred, during the first two years of their occupation, six other instances of consumption and fourteen instances of acute rheumatic fever.

It is not invariably the new house that is rendered dangerous by being damp. There are in this country many old houses, picturesquely situated, which are not less dangerous. The stranger passing one of these residences is struck by its beauty. There is the ancient moat around it, or the lake in front with the sailing-boat and swans, the summer-house and splendid trees down to the water's edge. The stranger may well enough be fascinated by the view, but let him inquire and he will too often find a truly ghostly history of the place. He will be told, probably with some exaggeration of the truth, that the house is unlucky, that no one who has lived in it has reared a healthy child, and that a traditional malediction taints the place. If he enter the house he finds a basement steaming with water vapour; walls constantly bedewed with moïsture; cellars coated with fungus and mould; drawing-rooms and dining-rooms always, except in the very heat of summer, oppressive from moisture; bed-rooms, the windows of which are, in winter, often so frosted on their inner surface, from condensation of the water in the air of the room, that all day they are coated with ice. The malediction on the young nurtured in that mansion may not be so deep as is rumoured, and it is much less obscure than is imagined; but it is there, and its name is "damp."

Impurity from metallic poisons and from inorganic dust.

A new disease has been induced of late years by the coloured compounds contained in the papers which are used for covering the walls of bedrooms and sitting-rooms. The papers are those into which arsenical substances are introduced, and the symptoms induced by them are due to the escape of minute particles of the arsenic into the air of the room. The phenomenon of slow arsenical disease, so caused, is an irritation of the eyes, of the lining membrane of the nose and of the back of the throat. This is the most ordinary symptom, but in extreme instances the mischief extends further. The irritation in the throat passes to the lining membrane of the bronchial passages, causing cough and irritable breathing, or to the stomach and bowels, giving rise to pain and diarrhœa. Again, the arsenical compound, finding its way into the stomach, and being absorbed into the general circulation, sets up irritation of the mucous membrane of other parts, such as the mucous tract from the bladder, and gives origin to pain and irritation when the fluid secreted by the kidneys is voided. Lastly, the skin may, in turn, become affected, and a distinct eruption of red erythematous patches, followed by scaliness of the surface and attended with considerable irritation, may be a result.

While these sheets have been in preparation, an example of disease, induced in the manner and in all the gradations described, has been under my observation. In this instance the patient himself for a long time suspected the cause of his ailment; he traced it to the paper on the walls of his bed-room which paper, on examination, was found to be strongly arsenical. After it was removed from the walls and the air of the room was purified by good ventilation, the symptoms of disease, that had been so long in activity, disappeared in a few days.

I notice, in the last place, that the air may be the bearer of various kinds of inorganic dusts which, carried into the lungs, are causes, first of irritation and afterwards of organic disease. To this subject further reference will be made in the next chapter.

CHAPTER XVI.

DISEASE INCIDENT TO SOME OCCUPATIONS.

In the chapters on diseases from mental and physical strain I have treated on the subject of work, generally. In the present chapter I have to treat on some special kinds of work or occupation, in their relation to disease.

There are occupations which by their very character induce disease; that is to say, the person who follows them is of necessity exposed to danger. These various pursuits expose the employed to noxious vapours, or to mechanical injuries, or to extremes of heat and cold, or to excessive fatigue. There are occupations which are not, of themselves, injurious, but are rendered dangerous by imprudence, neglect, ignorance, or prejudice; these are widely spread and extend to most of the mechanical arts. There are occupations which, perfectly harmless in themselves or even conducive to health and length of life, are made evils by the intensity and concentration with which they are carried out; in following them the organism is fatally wounded at one centre, while the mass of it is healthy,—precisely as a bird is often fatally wounded by a single shot.

The diseases which follow from occupation are all derived from physical causes, and they appear through physical injuries inflicted on the bodily organs. Even when the symptoms take the form of mental alienation they have a preceding physical origin in change of the physical constitution of nervous matter.

The subjects of disease from occupation are of two broad classes. (*a*) Those who work with their heads and use their muscles as the mere engines or instruments of their will. (*b*) Those who work little from the brain, who have acquired certain physical muscular faculties which they bring into action with automatic skill and regularity, and who wear out by such action itself, or by the addition of certain surrounding influences which add to the exhaustion. The first of these belong to the professional, commercial, and indefinite classes of the Registrar General's census tables; the second to the domestic, agricultural, and industrial classes of the same statistical authority.

The diseases incident to these two great divisions of civilized men are most unequally divided. The brain workers suffer from many severe diseases of a mental order which appear in physical symptoms, while they escape many diseases which are purely of physical origin. The others suffer from diseases of mental as well as of physical origin, and the misery of their lives is only ameliorated by the shortness of the trial. In brief, the mental workers suffer least from painful disease, live happier, and live longer than those sons of slavish toil who still depend on the automatic hand for their bread, and who are still but the mighty machine to the mightier mind.

Diseases Incident to the Professional Classes.

The diseases which especially affect the professional classes, vary rather in degree than in character, and are exceedingly limited; for, when the labour of the brain is carried on with evenness and order and generalization, brain work is healthy work. The brain is the most enduring of organs; the organ that admits of most change; the organ that requires most change; the organ that is the most perfect repository of animal force and the most ready dispenser of it; the organ that can rest in its jaded parts and work in parts that are not jaded, at one and the same time. Mental work, and even hard mental work, is, therefore, conducive to health of life and length of days. The dangers of brain work are from extreme strain or shock affecting the grey matter of the cerebral structures; strain induced either by persistent and prolonged struggle, or by sudden and vehement shock conveyed by the senses and translated, too urgently, into conscious or unconscious action.

They who make literature a profession incur according to my experience of them, no danger from the work itself. The copyists who vend the news or the impressions they have immediately received, who have not even to tax the memory for old facts as they write, are subjected, by their simple work, to no further waste of force than is expended in muscular action, and to no further waste of nervous force than is expended in attention. But it is often the fact that these workers are driven to pursue their occupation at late hours; or they have to sit for long periods in a close and crowded court or room; or they are compelled to work in a position, in which the chest cannot have full play. These circumstances, coupled now and then with a little too much negligence in eating, drinking, and avoiding, make them dyspeptic and nervous, so that without being actually ill, they are led to feel their life a dismal burthen. Those of them who are disposed to consumption find also their labour to be a factor, helping to light up the disorder.

Moreover, from the circumstance that they are a badly remunerated class, the copyists suffer severely from those diseases from worry which have already been recorded.

The higher class men of letters,—they who think as well as write, are subjected to greater perils. The labour they follow need never be injurious to the physical organism, and the length of life that has favoured some of the most laborious original writers and thinkers is proof direct that danger does not of necessity lie in the work. But most literary labourers are, nevertheless, exposed to two or three sources of danger, from which many of them suffer, and a few succumb.

The first of these dangers is that of concentration: a too earnest and prolonged study of one subject, a persistent strain on one nervous centre. For many years this strain is borne with comparative impunity; but, at last, failure is certain, and is usually followed by irritability of mind, feeble restlessness of action, and that peculiar helplessness, bordering on, if not passing into, paralysis, which we are accustomed to define as premature old age.

A second danger to which they who think as they write are exposed, is that of sudden and often repeated tension, the danger of labouring under rapid and intense thought, with an impulse to chronicle instantly, and at any time, by night as well as by day, what are called "happy conceptions." These habits keep the mind sleepless and watchful, the body restless and feverish, and the whole nervous system in dangerous unsteadiness of function. The men who give way to such habits are soon conscious of that new and unnatural existence which in the chapter on mental strain has been already described.

A third danger equally important, and more to be dreaded because often enforced, is that of writing against time: of feeling the constant sense that the printer's devil is at the back of the chair, and that the mind must be held in readiness to direct the hand to write at any length, long or short,—the short, by the way, being often the most laborious,—on any conceivable topic.

Our philosophical and historical writers feel most acutely the first of these dangers; our poets and novelists the second; our journalists the third.

The diseases which are more peculiarly seen amongst the members of the *clerical* profession are chiefly of the nervous order. Even that relaxed irritable condition of throat from which they suffer, and to which the name of "clergyman's throat" is applied, is in nine cases out of ten induced, if not excited, by exhaustion of nervous energy. The monotony of their lives, the persistent strain of visiting and preaching to the same audience week after week for many years, and the strict and rigid rules of action which society weaves round them, that it may itself have more freedom, on the ground that it is not a clergyman, these influences are all detrimental to the nervous health of the preacher. He has moreover to learn the discipline of his order, which in many cases is sufficiently severe. If he must obey his superiors in the Church, they know how to enforce rule: if he must obey the behests, doctrinal and moral, of those to whom he ministers, they too know how to enforce not one but many obediences.

Thus, unless he belong to the Church of England, and be blessed, even in her service, with churchwardens of unusual and perpetual complacency, the minister of religion, much as he is theoretically respected, is subjected to the pressure of opinion more than any other educated man in the community. The service he renders under these circumstances determines largely his physical complaints and endurance. He is apt to become melancholic, and knowing that the smallest thing he may do may subject him to the criticism of those who form his congregation, and who become soon, to him, the world in which he is cast, he is led to be abnormally sensitive to criticism, and at the same time hypercritical. Some of the class moreover seize one or other of the varied debateable and mysterious points in theology, and wear their hearts out in striving to prove and re-prove the dogmatical theory they have adopted, not merely for the satisfaction of others but also for their own satisfaction.

Diseases of the nervous system are induced readily enough by such labours as these, carried on as they are with little change of scene or action: but as the clergy, generally, are from the first provided for, poorly enough, truly, yet with sufficient to meet their simple necessities, as they live temperately, have few temptations for ambition and personal display, and have no urgent reasons for breaking their natural rest, they continue long-lived, and remain at their avocation often to the end of their days. The affections which specially disable the clergyman are diabetes, irregular and intermittent action of the heart, rheumatism, neuralgia, sleeplessness, and melancholia.

The representatives of the *legal* profession are more exempt from nervous ailments. They suffer much from dyspepsia, due largely to the confinement within doors to which they are subjected, and to their extraordinary notion, one might almost call it "delusion," that the offices in which they work should be the dustiest, most ill-ventilated, and dimmest dens of the whole circle of educated society. They are more often subjected to worry than the clergy, and though they make a larger amount of money, they lead a harder life until they reach eminence. Then in both branches of their profession they attain more than the ordinary share of life.

The ailments of the lawyer specially connected with his professional work include, chiefly, those derangements which follow irregular and imperfect function of the nervous and digestive organs, such as rheumatoid, gout, and diabetes.

Medical men, as a class, are remarkably free from disease when all the details of their lives are taken into consideration. They have to pass through singularly trying ordeals. The first introduction into the dissecting room; the first lessons in the operating room; the first practical instructions in obstetric art; the first performance of post-mortem examinations; the first visits in cases of infection; the extensive field of learning that has to be traversed for passing and obtaining the necessary honours and degrees; the early struggles for practice, when youthful strength is the certain preventive to progress; the constant activity and expectation when success comes; the night and day toil; the intimate conversance with human misery, mental and physical, in all its most terrible forms; the implicit trusts and confidences that have to be received and maintained, with a watchfulness that knows no limit. These taxes on the man of physic, which continue as long as he follows up his occupation, seem at first sight sufficient to shorten his life-struggle, and to render it, while it lasts, all but intolerable.

The facts give a result very different from that which might be supposed. As a man going into battle loses the sense of fear when once the engagement commences, so the medical man, fairly started, feels in the actual conflict with the dangers and dreaded duties lying in his way that these are often easily overcome when they are resolutely faced. In a brief time his familiarity with the conflict removes the early sense of anxiety, and, like the soldier in perpetual campaign, he ceases to be startled or surprised by any of his duties. Moreover, he soon learns, from practice, a theory of living which he may never have heard formalized as a system of philosophy. He becomes unconsciously a necessitarian. He is the servant of necessity, and in her service discovers that if, at every moment that he acts, he does his best according to the light of knowledge afforded him by the age in which he labours, he must be right. He also learns by necessity to throw off painful impressions so soon as he is removed from them. The painful sights and sorrows of the day fade from him as he passes from one to another, or from them all to some new and happier scene.

When the medical practitioner is duly seasoned in his work, when he is diverted by other and distracting pursuits from those which are purely professional, and when his work is carried out without that slavery to it which greed begets and fosters, he leads a life that is healthy up to the average. He has scope for muscular exercise; he has always to be acquiring some new information which keeps the mental organism employed; and, as he soon discovers, again from necessity, that to make his presence endurable to the sick he must be serene and cheerful, he acquires this temper of serenity and cheerfulness. I have not a doubt, and I speak from a large experience of them and their ways, that, taking them all in all, the members of the Esculapian fraternity are the cheerfullest and the happiest of any section of the community. I have not known amongst them an instance of melancholia; I have rarely met a well-marked instance of hypochondriasis; and though they sometimes imagine they have detected diseases in their own bodies which do not really exist, they far more frequently err in not taking care of themselves, and in deferring to submit to treatment when they are suffering from actual disease. They prefer to die in harness, and their preference is usually gratified.

The diseases specially incident to medical men are, intermittency of the action of the heart, induced usually from broken rest; rheumatism and bronchitis from exposure to cold and wet; diabetes from excessive nervous fatigue; and, paralysis. They are also subject to some rare accidental diseases from which other men are exempt; notably, to that most fatal poisoning which follows a wound, from the knife or the needle, inflicted while carrying out the dissection of a dead body, or even while performing a surgical operation on the living subject.

Men whose lives are devoted to the *fine arts* are less subject to the graver physical evils than the professional men. Their ailments, however, differ materially, according to the line of art which is pursued. They who follow painting as an art, though they are sometimes for long hours shut up in the studio, and are working almost like men of letters, obtain recreations and pleasures which greatly relieve the monotony of their lives, and which add, in no small degree, to their health. They make their journeys to Rome, Venice, and various parts of England, and indeed lead an existence which is most invigorating and delightful. Exceptions must of course be made for those who suffer from pecuniary difficulties, who labour for the mere means of existence, and are obliged, in the studio, to conjure up subjects for the pencil from the worn-out recollections of the past. But compared with the mass of mental workers these are very few, too few for any inference to be drawn, or fact displayed, as to their special diseases.

Painters may indeed be considered as largely exempt from mental strain; but they have trials which tell upon the heart, in respect to the position which shall be gained by the work which they have done. I believe this is really the greatest danger to which the painter is liable. His work is so light, so chaste, so fruitful of enjoyment, and so confined to those hours of the day when the sun shines, that he cannot seriously suffer from it by over-exertion. But for these very reasons, being retired from the world and understanding little of it, he chafes sorely under unjust criticism, and often frets himself into a nervous, hesitating condition, which renders his life wearisome and enfeebled.

Concerning those who follow *poetry* as an art, we have heard much said,—a vast deal more, I take it, than ever was true,—as to their sufferings.

The world has not produced a sufficient number of poets for us to calculate whether poetic art is at all destructive of mind or of body. The instances of destruction that have been adduced are too few and too questionable to be relied upon, and the romance which is made to surround destroyed poets is too extreme to be believed by the physician.

The *dramatic artist* differs from the classes previously mentioned, both in his labours and in his troubles. To men of strong build and firm will, to men who possess by nature the very faculties which they represent, dramatic art may offer few anxieties or perils. We know, from experience, that some of our greatest actors have passed through their careers, extending over a long life, without suffering beyond other men; but if my observation serves me well, the majority of players are very differently placed. A man in the studio can labour at works of art calmly and quietly, thinking, deliberately, as he touches the inanimate canvas, of what can be said of the result. But this is most distinct from the art in which the man transforms his own body into art, and appears suddenly before a crowd, exhibiting himself in attitude and character to personify what he has never seen. To pass through this ordeal, the intensest labour and presence of mind are required, the strongest volition, the most refined conception.

We have an illustration of this intensity in those cases common, I believe, to almost every player, when the artist, at his first appearance, is said to be "stage struck;" when, for the moment, the circulation stands still, the muscles are rigid and the face deathly. This is the first, and probably the most painful, ordeal, and it is an ordeal which rarely ceases altogether. Without manifesting itself with the same active symptoms as those that are combined at the "stage-struck" period, it keeps alight a nervous irritable excitement, which intensifies up to the period for taking part in a performance, which gradually subsides during the performance, or is transformed into enthusiasm. It is followed, when the excitement has subsided, by a depression that may amount even to despair; a depression which applause and admiration do not satisfy, but which unjust or unfair criticism goads either into melancholy or apathy.

Under these influences, many of our really best players sink into second or third positions, not because they are wanting in the talent to stand in the first, but for the reason that they prefer the ease of mediocrity. Under the same influences, some of our players who do stand first become cross, irritable, or desponding, find no satisfaction in the temporary approbation which they achieve, but feel overwhelming chagrin at every shade of disappointment.

Still more, in the very act of sustaining certain characters on the stage, vehement physical efforts are called forth, which demand a degree of muscular exertion, mental strain, and expenditure of vital force altogether, of which the mere looker-on forms no adequate conception. Take the play of *Othello*, for instance, as indicating the character of the labour that is required of the actor. The mere effort of speaking such a play is beyond the reach of ninety-nine men out of a hundred; but add to the speech the action, the studied expression, the passion. What can be more onerous, exciting, or severe? In the intensity of the passion the brain is so tense, it is as if it would distend the rigid skull, while all common surroundings are lost to view.

The labours of the player tell on the brain and the heart. The heart becomes irregular in its action; then, for a time, large and over-strong; and, finally, degenerate, feeble and uncertain. With these changes are combined excessive timidity, sleeplessness, persistent dyspepsia, paralysis, and gradual decay. Whenever sensations thus excited lead the actor, unfortunately, to resort to the use of stimulants; when without a stimulant he is unable to meet his audience or to recover from his labour, he is beginning to suffer from a second destruction, more fatal than the first.

There are few diseases special to the *artist in music.* It has been said that players on wind instruments are much less susceptible to diseases of the chest than are other persons, and that to learn to play on a wind instrument is good practice for those who are predisposed to consumption. In this statement a part only of the truth is told. There can be little doubt that persons predisposed to pulmonary consumption are benefitted by every exercise that tends, without violence, to expand the lungs, and that the practice of blowing a wind instrument is useful, if it be done with moderation. The tables are turned entirely when the practice is carried to the extent of daily and wearisome work: then, in time, the lungs become unduly taxed, their minute air vesicles give way, and the disease emphysema is the result. In professed players on wind instruments, I have several times seen emphysematous disease thus induced.

Amateur wind instrument players exhibit other symptoms. An amateur flute-player I knew became cyanotic from the exercise: his lips became blue, the surface of his body cold, and the action of his heart irregular. In the tension from holding his breath the right side of his heart was engorged, and a weak closure of the fœtal opening between the right and left auricles gave way; thereupon venous blood, in its course towards the lungs, passed direct into the left side of the heart without undergoing oxidation and arterialization. Another amateur who was given to clarionet practice, was always seized, after much playing, with vertigo, and was obliged, in consequence, to cease the prosecution of the art.

Players on stringed instruments are not altogether exempt from special disease. The harp-player loses the sensitiveness of those parts of his fingers which strike the strings, and I have known one remarkable instance in which a violoncello-player became locally paralysed in those fingers of his left hand which were exercised on the strings of his instrument. The paralysis commenced in the little finger and passed from one finger to the other until the hand was disabled.

Those who interpret music by the voice, are very subject to injury of the delicate musical instrument they themselves bear. The human cords which, by their vibrations, give forth such exquisite melodies, are apt to become mechanically impeded in their motion by congestion and inflammation of the surrounding parts. By irritation, direct or reflex, the muscular mechanism may also be disturbed so that the will, however ready, and the mind, however instructed, lose refined command over the muscular tension. Then occur those unfortunate periods when the artist disappoints the audience that comes to admire or to criticise; then, sometimes, the happy fate of the sufferer is cast away, and, dismayed or broken-hearted by the failure, he never ventures to succeed again.

We have no sufficient evidence to show us whether the geniuses of music who enrich the art and keep it freshly alive, are disposed to special disease from their immortal work. Some of these, such as Handel and Haydn, lived to good old ages: others, such as Mozart and Mendelssohn, died young. But whether they who died young succumbed to their particular work, and whether they would not have died as young from devotion to other work to which they might have applied themselves with equal energy, if not with equal success, it were indeed hard to determine.

Around musicians of all kinds and grades, there exist, as around the player, that poetry and enthusiasm of art which men following duller pursuits know nothing of. These influences tell also on the nervous fibre of the artist in sweet sounds, so that the nervous maladies of the stage are as those of the orchestra.

Under the head of professional classes there are included other representatives of particular occupations than the typical ones which have been before us. Those who are engaged in naval or military service, those who follow teaching as an art, those who follow pure science as a means of livelihood or reputation, would come under consideration now if any special word were necessary. The diseases incident to their labours are, however, so closely allied to those of the other professions, it would be repetition to treat on them.

Diseases incident to commercial occupations.

Men engaged in *commercial* pursuits are apt, in the absorption of business affairs, to fall into many of the errors committed by the professional classes, and with the same results of disease from mental and physical strain. They subject themselves, with unusual readiness, to broken rest, to irregular meals, to confinement in the office, to competitive struggles of a keen and tense character, and to passions of hope and despondency. They rarely possess that dispassionate and thoughtful temper which comes, so naturally, to the minister, the lawyer, and the physician, and the reason of this is simple enough. They are absorbed, without diversion of mental exercise, in their own affairs. The sorrows, mistakes, and failures of other men, by which they might contrast their own, are not constantly before their eyes. Hence they are given to judge others by their own standard, and themselves by none other. Hence they are full of their success in life; or, if they meet with failure, are full of that also, lamenting it as if all the world were agonized. The successful man has their sympathies, the unsuccessful their contempt. To their minds the man who is unsuccessful is not a man of business, is not practical. In their circle of reasoning and stern argument, they award judgments which, like the laws of the Medes and Persians, are unalterable when once awarded.

Together with these acquired qualities which are considered to be business-like and determined, these commercial men acquire a distrust of mankind in general, a distrust which is singularly injurious to mental serenity.

Their mode of correspondence, hard, short, and leading studiously to abruptness, is itself sufficiently characteristic of the firm and personal resolve with which their every act is performed. The mathematical exactitude with which their books and accounts are kept, with which ledgers are made up, and with which balance-sheets are struck, mark an equally intense earnestness and singleness of purpose, all bearing upon the aim and interest of the individual man. To him, in his purely commercial mood, the ledger is the one book of nature, whose leaves record the poetry, the art, the science, the literature, the sentiment, the sympathy of life, as hardly written as the hieroglyphics on an Egyptian sarcophagus. Too often, indeed, this ledger is the sarcophagus in which the owner is buried alive.

Some few men engaged in commerce are so fortunate, at an early period of their careers, as to find, in literature, art or science, a diversion from the all-pervading spirit with which commerce fills her choicest votaries. It is well for the favoured few that so happy a change occurs, even though it be at great loss to more prosperity; for the unbridled spirit of trade is a dangerous master.

They who live solely for gain are amongst the acutest physical sufferers of the world. Every penny earned, by excess of hard strain for it, is grasped at a cost of vital power that never comes back. Disorganized heart, disorganized brain, are the physical evils,—described in the chapter on worry and mental strain,—with which the prize, when it comes, is won.

Some other special diseases occur to those who hold subordinate positions in the commercial world. The scrivener is seized with the local paralysis to which the name of "scrivener's palsy" has been given. The commercial traveller suffers from those nervous affections produced by railway travelling, to which I have drawn attention in a previous page; and the overtaxed messenger and letter-carrier undergo the penalties of physical overwork. But the gravest special diseases of men engaged in commercial life are those which are born of too exclusive a devotion to the making of money.

Diseases incident to persons of indefinitely classified occupations.

Persons of indefinitely classified occupation are —(*a*) Those members of society who possess sufficient property to live independently, *i.e.* without the pursuit of any regular and special labour. (*b*) Children and students who are still at their education. (*c*) Men who give no name to their work, who live "by their wits." (*d*) The residuum of society, the still existing vagrant class.

The first of these present characteristics so closely resembling those of the easier-going professional classes I need not refer to them. The last are too indefinite to admit of much description, in respect to the diseases incident to the work which they perform. On classes (*b*) and (*c*) some attention must be bestowed.

Children and students are subjected to many evils from their occupations.

The endeavour to fill too hastily the minds of children with artificial information leads to one of two results. Not unfrequently, in the very young, it gives rise to direct disease of the brain itself, to deposit of tubercle if there be pre-disposition to that disease, to convulsive attacks, or even to epilepsy. In less extreme cases it causes simple weakness and exhaustion of the mental organs, with irregularity of power. The child may grow up with a memory taxed with technicals impressed so forcibly that it is hard to make way for other knowledge. Added to these mischiefs there may be, and often is, the further evil, that the brain, owing to the labour put on it, becomes too fully and easily developed, too firm, and too soon mature. It remains throughout life a large child's brain, very wonderful for power in a child, but very weak in a man or woman.

The development in an excessive degree of one particular faculty is another common cause of feebleness. I knew once an instance in which a child was "blessed" with a marvellous gift of verbal memory. This being his "forte," his teacher, who wished every scholar to be remarkable for something beyond other scholars, played on the "forte" incessantly, and with wonderful effect. By constant cultivation of the one faculty this marvellous boy could learn off fifty lines of "Paradise Lost," or of any other English book, at a single reading, and could repeat his lesson on the spot, without missing a word or omitting a comma. But the result was so bad that when the boy was sent from school to a university to learn a profession, he was beaten in the learning of detailed and detached facts by every fellow-student. Seeing, slowly but surely, where his weakness lay, the student ceased at last to call into play his remarkable talent. It was a terrible task; a task he accomplished at last to a considerable degree, but never effectually. For a long time he made mistakes that were most annoying: he was unable, for instance, to cast up, accurately, any column of figures; he forgot dates and omitted to keep important appointments; he misnamed authors in speaking of works of art or letters; and, in reasoning, his want of analytical power was painfully felt. It took him full ten years to unlearn his wonderful technical art.

Overwork in the child and in the student defeats its own object. It does not develop the powerful brain so necessary for the man; for life is ever a new and great lesson, and some young brain must be left free for the reception of lesson on lesson. But the danger of overwork is, unfortunately, not confined to the brain, it extends to the body as a whole. When the brain is overworked in the growing child, however well the child may be fed, and clothed, and cared for, there will be overwaste of substance in proportion to the overwork. There will be stunted growth and a bad physical body.

The men who live by their wits, who proclaim no definite occupation, but who are said "*to speculate*," are the outcasts, usually, of some profession in which, had their talents been properly applied, they might, perchance, have won a respectable position, or even fame. They leave the straight and correct path, and with strange ups and downs try to reach the goal of success by the insane process of seeking it though blind and devious ways. As a result, they suffer exceptionally from both physical and mental strain. The man who during life has simply to meet his difficulties one by one, as they appear, one up and another down, has hard work; but the speculator meets obstacles on all sides, and while he is winning in front, must often find himself held back by a strong hand in the rear. His life is to waylay, to calculate how he shall make up a book that shall win, come what will.

The absorption of this man's thoughts in his own labours and devices removes from him generally the idea of illness and of death. He differs from the man of ordinary business, in fact, in his carelessness as to the needs of his own physical existence. His life is surrounded with a kind of vulgar romance. His overweening self-confidence, and his consciousness that he either can or ought to devise schemes and calculations that must or should carry the day, create in him an enthusiasm which might well be devoted to a better cause. By and by, in spite of himself, and in spite of his absorption, he begins to fail, follows usually the course of resorting to stimulants, by way of support, and at last suddenly breaks down hopelessly and completely.

The ailments of the speculator are usually compound in character. He is, in most instances, a man of active life, the whole of his organism, muscular and nervous, is equally taxed, and he is exposed to a variety of exhausting influences. His first symptoms are, ordinarily, an irregular action of the heart, with a failure of that organ. In the majority of cases he succumbs, after exposure, to some sub-acute inflammatory disorder. He takes cold, suffers from congestion of the lungs or kidneys, and, unable to bear the shock, sinks rapidly under it, his mind becoming intensely irritable, or even losing its balance. Often he does some foolish thing, trips in his calculation, and is pronounced "insane;" or is left to endure a life too wretched to be worth its continuance. Signally, he adds to the lists of those who form the suicidal class of the community.

Diseases incident to Domestic occupations.

The members of the population brought under the head *domestic,*—including in England and Wales 5,905,171 persons, of whom 5,660,443 are women,—are engaged in domestic work, in superintending or carrying out the duties of the household. They suffer from physical overwork, from confinement in the house, which leads to indigestion and anæmia, and to a few special maladies attached usually, by want of care, to some special employment. The women who in the kneeling position scrub floors, get that inflammation of the knee-joint, with effusion of fluid, to which the common name of "housemaid's knee" is applied. Waiters who are obliged to carry heavy weights up long flights of stairs are subjected more frequently, perhaps, than any other class, now that the days of the postboy are so nearly ended, to aneurism of the aorta. Women engaged in laundry-work, and who are exposed to intense moist heat, are rendered feeble and anæmic, and are occasionally so reduced by the work that they faint, fatally, over it: this occurred to two persons within my own knowledge, to both of whom I was called when medical aid could be of no avail.

Great evil is done to domestic servants by the manner in which they are lodged at night.

Young and inexperienced people on taking a house are apt, from sheer thoughtlessness, to consider the servant's bedroom of the least importance, and there are many older managers who maintain the same indifference. The domestics, consequently, are lodged in the most out-of-the-way rooms in the establishment; in rooms having no means of ventilation, and so little healthy space that refreshing sleep is rendered impossible. I have often noticed in dispensary practice, in my capacity of physician, that more than half the illnesses of the domestic class were due to this one cause. It frequently happened that those servants who were best fed were worst housed at night, and many a case of pulmonary consumption have I been forced to trace to its origin, in the fatal and thoughtless error here defined, an error frequently as little recognised by the servant as by the master.

Diseases incident to Agricultural occupations.

The physical diseases incident to agricultural pursuits are those which are induced by the external uncontrollable causes, by exposure to the wind and rain, to heat and cold. Acute inflammatory and rheumatic affections are more marked amongst the agricultural than amongst other classes; and, indeed, it is now amongst them only, that we see those sthenic inflammatory attacks which the doctors of last century described so naturally, and which they cured by the free abstraction of blood. Physically the farmers have the advantage of following the healthiest occupation of the whole community, and the farm labourers, except for the indifferent homes in which they are lodged, share with their masters in this advantage.

Diseases incident to Industrial occupations.

The diseases incident to industrial occupations are of extended range. Of these the largest class affect the breathing organs, so many occupations being necessary in which the lungs are exposed to the irritation arising from inhalation of foreign matters, in the form of dust or vapour. The coal-miner inhales the fine particles of carbon; the knife-grinder the particles of steel; the cigar and snuff-maker the dust called "shorts;" the sand-paper-maker, minute particles of sand or pounded glass; the hemp and flax dresser, the dust of those substances; the trimming manufacturer, the fluff of silken and hempen stuffs; the fur dyer, the fumes of nitric acid and the dust of copperas; the bleacher, the vapours of chlorine or of sulphurous acid; the house painter, the vapour of turpentine.

Exposure to the action of all these substances is a direct cause, in many instances, of local pulmonary diseases which are often fatal, and always serious. Consumption proper, and bronchial affection find in these occupations, and in others allied to them, their frequent causes.

Other industrial occupations lead to other local diseases. Exposure to phosphorus leads sometimes to disease of the jaw-bone. Certain forced positions of the body for work lead to distortion of the spinal column or of the wall of the chest. Exposure to lead causes an intestinal spasm, "colic," or, if long continued, a paralysis of the extensor muscles of the hand, and "drop wrist;" the glazing of pottery is thus injurious. Men engaged in businesses which call for violent exertion, carpenters, blacksmiths, rowers, induce singular muscular developments, nervous feebleness, and mechanical derangements of the vascular organs. Men working with chemical agents are subjected to injuries from them; thus, exposure to the bichromate of potassa induces sometimes a peculiar cutaneous ulceration, and exposure to arsenic an irritation of the mucous surface of the alimentary canal and of the other passages of the body which are lined with mucous membrane.

CHAPTER XVII.

DISEASE FROM SLOTH AND IDLENESS.

As a set-off, miserable enough truly, against disease from excess of work and deficient rest, the physician observes in the course of his life, certain phenomena originating in that mental inertia, and physical inactivity resulting therefrom, called idleness. Idleness, in the strictest sense of the word, is, according to my experience, a rare phenomenon; for those who do not work in the ordinary meaning of the word, occupy themselves, as a general rule, at play or pastime. Some persons indeed work harder at their play than many of those who have to make a living by their industry.

There are, however, sections of really idle people of whom it may be said fairly enough, as Shakespeare said of great people, "some are born to idleness, some achieve idleness, and some have idleness thrust upon them." The first are the idle by actual hereditary taint of feebleness. The second are men who have been industrious perhaps beyond reason, and who, having earned a competency comparatively early in life, "retire" from labour to enjoy a luxurious ease or an absolute rest. The third are those unfortunate pets, I had nearly written pests, of society, who, in the family and friendly circle, are considered privileged to do nothing; who are thought to be too weak, or too good, or too superior, to be subjected to any annoyance of labour, and who feel, as a consequence, that they confer a privilege when, in allowing others to wait upon them, they are not too exacting in their demands.

The idlers of the first class, those who are born to idleness, are often severely criticized when they ought really to be pitied. They are, I believe, one and all, deficient in organic build. Their volitional centres are incompetent to the performance of duties that are considered common duties by the majority of mankind. They lie midway between the actual imbecile and the feeble but willing industrious, and with their mental inertia, they have some marked physical infirmity. I may say of all of them that they are of strumous constitution, of relaxed muscle, of thin pale blood, and of feeble voice. Their physical configuration varies, however, in important respects, as to external appearances. Some are lank of limb, sunken of face and thin of body; others grow unduly fat so as to be a burthen to themselves. They all learn little, and retain only for a short time that which they have learned. They are singularly helpless with their hands; their wrists drop, as if their extensor muscles were paralysed; and they usually have small and aberrant eyes. As children, these unfortunates, unless they are well protected, lead wretched existences: at school they are the butts of their stronger companions and the torments of their teachers, who fail, equally, by persuasions, rewards, blows, to make them active or learned. Happily for themselves they are less sensitive than their fellows, and almost happily for themselves they are usually short-lived. Possessing no cerebral resistance, they rapidly sink from acute disease, from accident, or even from moderate physical efforts into which they may, in emergency, be peremptorily forced.

The idlers of the second class, those who have earned idleness, are hardly less to be pitied than the born idle. They are men worn out already, though they may still be young, and they seek in repose the pleasure for which they have yearned throughout their lives. They separate themselves, irrevocably, from the business or profession with which they have become familiar; they feel incompetent to acquire any new pursuit; and they settle down to court rest; or, for the dignity of the thing, they give up their leisure, for short periods, to magisterial or other public duties for which they have never been trained, and for the performance of which they have as little capacity as they have for commanding a fleet, or taking a transit of Venus.

These victims to an acquired sloth,—for if it be persistently urged, sloth is so acquired,—soon become diseased, either in mind or in body. They suffer quickly from *ennui*, and either fall into hypochondriacal fancies with the dread of death ever before their eyes, or sink into actual despondency with such acuteness of despair that suicide suggests itself as the only mode of relief.

Men thus circumstanced succumb readily under any uncommon strain or injury. They fail rapidly under slight attacks of acute disease; they make but feeble resistance to the action of cold; and, at their best, they drift into the paralysis of premature old age. Or, rusting in idleness, and tempted to eat and drink more than the body, in the midst of its full powers, could dispose of, they acquire a feeble heart and a weakened vascular mechanism of the brain: then they succumb suddenly from failure of the heart and syncope, or from pressure of blood on the brain and, so-called, apoplectic stroke.

The idlers of the third class, they who have idleness thrust upon them, are found in both sexes of our modern life; but I think I must say they are most frequently found amongst members of the female sex. These lounge through every day and through every task they undertake; they lounge even through play, and acquire such a detestable habit of rest that to take a walk or a bath, to do the most trifling piece of handy work, to write a letter, to accept any trouble or care, becomes a veritable anxiety and pain. They know nothing of true happiness,—for life with inactivity is a physical burthen and is carried about with the sense of its weight ever pressing on the mind as well as the body. If they are men, they commonly become dissolute from drink and sink into that abyss of reckless abjectness which ends in fatuity and general paralysis. If they are women, they fall into worse perils: they marry, become the helpless mothers of helpless children and persistent and intolerable anxieties to their husbands and friends. They sink into slatternly misery, lose every good look they ever possessed, and, like the equally idle man, fall, at last, into paralysis, hastened, too often, by intemperance or by the severity of neglect, with which their indolence is chased to its reward.

In some instances of acquired idleness of the kind now under consideration the wealth of the idler is so great that the idleness, in all its varied forms, is pampered and sustained. The pamperers, industrious themselves, either from mistaken affection or from interest, minister to the wants of the helpless physical being that lives to linger only in the world of life.

To these favoured idlers nature pays no heed. In her resistless course she builds up of such materials as are brought to her, and if her original designs be thwarted, regardless alike of the comfort or discomfort of the thwarter, she pursues her way. They who lie out of her designs are, therefore, doomed to the penalties that must follow. They may be sustained by misapplied medical art which, by one or other purely artificial or adventitious means, shall minister to induced disease. They may be protected by the warding off of all sources of trouble or irritation, and pleasure may be made a partial substitute for natural labour. All these arts and conveniences and substitutes do not, however, prevent disease. The indolent heart passes into unnatural paces of motion; the sluggish brain is reconstructed out of devitalized material; in the end there follows organic degeneration and premature ending of life from failure of vascular or nervous power.

Or, in these instances, if the physical organism works on beyond what is commonly the limit of its endurance, there is developed a mental feebleness and imbecility which end in complete failure of mental power. Doubt and hesitation are succeeded by distrust, distrust by fear,

fear by despondency and despondency by despair. Then the burthen of life, all through so heavy, is more than can be tolerated, and in the unreasoning or obviously false expressions of the invalid, in the persistent and automatic complainings, in the over-anxious face and helpless gesture we discern the imbecility of the insane.

CHAPTER XVIII.

DISEASE FROM LATE HOURS AND BROKEN SLEEP.

ALTHOUGH it is impossible to define in one term any one disease originating from irregular sleep and late hours of retiring to rest, there are certain impairments resulting from these habits which influence the course of the health and help materially to shorten life.

The man who is accustomed to go to bed moderately early and who takes his full rest of eight or nine hours feels quickly what are the symptoms of broken sleep if, for a single night only, he be deprived of his natural repose. The deprivation costs him, next day, a feverish feebleness, a wandering and hazy condition of mind, an uncertainty of action, a sense of vacuity, and a nervous susceptibility to sounds and other influences affecting the senses which, if not painful, are at least, disagreeable sensations. He detects, moreover, that two or three nights of good sleep are required to restore him to his natural state of mental and physical strength.

If, in the period of his early life, a man breaks the rule against nature and by a strong and persistent effort of the will, accustoms himself to short and disturbed rest, the signs of distress which the unrefreshed body first feels are modified, and extremely short hours of sleep may become the rule of life. We sometimes hear a person say that he can do with four or five hours of sleep, that he can sleep when he likes, and that it matters not how late he goes to bed for he always rises at the same hour. We hear youths, also, exulting in their youthful powers, affirm that time was made for slaves, and that they don't go home till morning, as if some great virtue of courage or of wisdom were conveyed in the declaration.

In time, sleeplessness acquired by habit becomes a practice which, when the body has arrived at full maturity and more rest from sleep is absolutely demanded, is not easily thrown aside. At such stage the bad habit tells on the life, and the physician finds no class of patient so difficult to treat successfully, even for mere functional derangements, as the habitually sleepless. There is about the patient a restless anxiety, an irritability, and a nervous feebleness which no artificial aid can, entirely, subdue.

The general symptoms which indicate the wearing influence of deficient sleep vary with the age of the sleeper. In the child too little sleep induces symptoms of restlessness, peevishness, weariness at play, emaciation, indigestion, and great pallor of the face and surface of the body. The enjoyments of the waking hours are curtailed, and a dulness which, by thoughtless persons, is commonly mistaken for actual stupidity, marks every effort at lesson or at play. These symptoms are followed by an inability to go to sleep at the natural time and by the occurrence of an unnatural, startled, dreamy sleep when the eyes are, at length, closed. The activity of the brain is thus maintained in the dream and another cause of nervous exhaustion is hereby supplied. The man who dreams does but half sleep; the child who dreams hardly sleeps at all.

I have said that no distinct name can be given to the indefinite class of symptoms which are encouraged and sustained by sleeplessness; but, indefinite as they are, every watchful mother knows their import in the child. They are the beginnings of a restless, feverish, easily impressionable, easily exhausted life.

In adolescents, even if they be, naturally, of sound constitution and firm build, deficient sleep is a persistent source of mental and bodily exhaustion. It induces pallor, muscular debility, restlessness and irritability. It interferes with that natural growth and nutrition of the body to which sound sleep so beneficently ministers, and it makes the work and the pleasure of the wakeful day unduly heavy and laborious.

These remarks apply to members of both the sexes, but they specially apply to girls. The anæmia, bloodlessness, weakness, and hysterical excitability that characterize the young lady of modern life, who is neither well nor ill, are due, mainly, to her bad habit of taking too limited a supply of sleep at irregular hours.

The feebleness which falls to the lot of the robust who deprive themselves in youth, or who are deprived, of the due amount of sleep, taken in due season, is greatly increased and is of much more serious moment when it falls to those who by hereditary taint are disposed to an acute wasting disease; to pulmonary consumption, to name the most familiar example. It is painful to me to recall how many times I have been obliged to see the first indications of pulmonary disease occurring as the result of late hours and broken rest: as the result of those unearthly balls and evening parties where the young of both sexes are called together to dance into utter prostration of mind and body, until the daylight dawns and the sun rises to expose the tawdriness of the ball-room and the helplessness of the half-dreaming, sleepless, pale, shivering revellers. By the end of a season of pleasures no single youth or maiden who is tainted with consumption stands safely from the disease. Many, truly, escape, but some always fall and all have been in danger.

In like manner the student who, over-anxious to gain the prizes of his college or school, wins by the robbery of rest, wins but to lose physical activity and length of days. Again, the poor and wretched young, they who are obliged to work into late hours and to rise early that they may earn their scanty subsistence, they, devitalized by many causes, are stricken by none more deeply than the famishing from want of sleep.

From adolescence on towards the close of that period of age where the body reaches, what in the first chapter of this book was called the level plane,—the period when the maturity is attained and the downward course of life is not yet on hand,—the strong man can resist sleep often for long periods. He is apt, in consequence, to trespass on the liberty he ventures to take with nature; and when from any cause he chooses to take the liberty, he congratulates himself, perchance, on the impunity with which he is able to violate the natural law. The delusion is not of very long duration. As the middle of the second stage of his career approaches the demand for more sleep becomes more urgent, and happy is he who at this crisis can recall to his service the friend he has deserted.

If in middle age the habit of taking deficient and irregular sleep be still maintained, every source of depression, every latent form of disease, is quickened and intensified. The sleepless exhaustion allies itself with all other processes of exhaustion, or, it kills imperceptibly by a rapid introduction of premature old age, which leads directly to premature dissolution.

A typical illustration of premature decay induced by broken and deficient sleep has been before me during the presènt year in the case of one of those indomitable members of my own profession, who too readily sacrifice life to duty. A man of slight build, but of singular activity of mind and body, and in all his career temperate to the utmost, this gentleman about twenty-five years ago secured a large general practice. With unremitting attention he carried out the duties of his profession year by year, without any change of scene or holiday, and for many years was accustomed to be called up at night four times in the week, on an average. To this mode of life he became, as it were, adapted, and really appeared to suffer nothing from it; but soon after he had passed his forty-fifth year he discovered that at times, in the day, he had an occasional unconscious period during which he did not actually sleep but was for a moment forgetful or lost. The attack was so trifling he was himself inclined to ascribe it to simple forgetfulness, and for a few months it nearly passed away, recurring only at moments when he had undergone a more than usual pressure of nightwork. At last the periods of loss of conscious recollection passed, in entire defiance of his will, into periods of actual sleep, from which, after an interval, he would wake up and be again ready for work. Step by step, week by week, these overpowering fits of sleep increased in frequency and extended in duration until they lapsed, finally, into one long sleep, with entire powerlessness of his limbs, a carelessness for nourishment and a persistent coma, from which he was aroused with difficulty. After this continuance of sleep had lasted a few days he gradually sank and slept the sleep that knows no waking.

The effect of irregular hours and of deficiency of sleep is developed sometimes in another way.

When the exhaustion from prolonged sleeplessness is felt, it is demonstrated through the heart. Intermittent action of the heart, of which mention has been made in preceding pages, is established, and all the evils belonging to that broken movement are set in train. This state of things is most readily induced in those persons who, while losing their natural rest, are engaged in working against time. Newspaper reporters and night pressmen are very quickly influenced in this manner, and become disabled before they are fully alive to their disablement. They feel at times a strange sensation of faintness or coldness coming over them, as if they were suddenly enveloped in a haziness or obscurity; but, by applying more desperately to their work, they dash the sensation aside until it returns too often to be disposed of so readily. Then they are discovered to be suffering from exhausted brain and irregular circulation.

Another effect is sometimes witnessed and is the most distressing of all. It is that the sleeplessness acquired by habit begets sleeplessness. The most extreme insomnia is herewith induced and the mind, knowing no rest by night or by day, is quickly off its balance. The very idea that sleep will not come under any circumstances, unless it be enticed by powerful narcotics, is itself preventive of all natural repose, and, as the dread of the sleeplessness increases, other morbid trains of thought arise in rapid succession. Some hypochondriacal monomania seizes the sufferer: he imagines the most improbable accidents are about to happen to him; he is constantly restless; he bites his nails to the quick, or keeps up some peculiar motion of his limbs, a rat-tat on the table, or a gesticulatory action of an exaggerated character. A man circumstanced in this manner passes, usually, with steady advance, into insanity, too often into suicide.

Those who are led into these extremest conditions of sleeplessness begotten by sleeplessness are most commonly men whose minds are ill at ease; who have been thwarted in some ambitious project; who have been detected in some offence against society which they hoped to keep from the world; or who, holding from the world some really terrible or imaginary terrible secret of their lives, lie awake calculating how they may remain ever on the alert and be prepared for action if the worst should come to the worst. These men are kept awake by the sentiment known as remorse, for which there is no remedy by repentance and no end but one, viz., derangement of the mind from its concentration on one object,—the re-establishment of self-respect in opposition to reason and fact.

Shakespeare, with all the skill and observation that might belong to the most learned physician, has grandly depicted the form of sleeplessness above defined. His Macbeth cries :—

"*Glamis hath murdered sleep.*"

His Gloucester, at dead midnight, argues with himself that he is and is not a villain.

"*Fool, of thyself speak well; fool, do not flatter!*"

and thus unavailingly strives to reason his mind to rest. To this day the types of the sleepless Macbeth and Gloucester live. We put them into asylums now.

There be some who, by sleeping at other hours than the natural hours of the night which belong rightfully to the purpose of sleep, strive to make up for that which is natural. The attempt is better than nothing, but at the best the success is partial only. I have seen all the evils incident to sleeplessness follow this supplementary remedial measure, if not with the same intensity yet with marked emphasis; and, sure I am that no man seeks sleep at irregular times or for diminished space of time without paying the penalty in reduction of energy and in shortness of life.

I have said that those who sleep differently and irregularly are more easily affected by direct causes of disease, and are less amenable to means of cure. To this should be added the equally important fact that those who are habituated to full and regular sleep are those who recover most readily from sickness. The observation of this truth led Menander to teach that sleep is the natural cure of all diseases. It is so. Sleep reduces fever, quickens nutrition, increases elimination, soothes pain, and encourages the healing of wounded surfaces. Whoever is first to discover the still secret cause of natural sleep and the mode in which it may be commanded by art, for the service of mankind, will be the greatest healer who has, up to this age, helped to make medicine immortal.

CHAPTER XIX.

DISEASE FROM ERRORS OF DRESS.

AT one time a widespread and very dangerous disease was induced in women by one particular error of dress, the error of lacing up the body, tightly, in stays. The disease was sometimes fatal, the heart and even the lungs being actually displaced, in extreme instances, by the pressure. In these days some improvement has taken place in respect to tight lacing of the body, but the evil is not altogether removed.

Taking them as a whole the diseased conditions which arise from errors in dress are reducible to five heads.—(*a*) Mechanical errors. (*b*) Errors affecting the amount of clothing that should be worn at different seasons of the year, and under differing circumstances of heat and of cold. (*c*) Errors in respect to ventilation of the body beneath the clothing. (*d*) Errors from the presence, in clothing, of irritating chemical substances used as dyes. (*e*) Uncleanliness of clothing and the consequent conveyance, by it, of organic poisonous matter.

From Mechanical Errors.

The worst mechanical errors in clothing are those which affect the chest and body. The tight band round the waist and the tightly-laced corset still play too important a part, and interfere with the free and healthy movements of young girls and women. The effect of the pressure is equally injurious to the organs of digestion, respiration, and circulation. The liver and stomach compressed, the digestive functions are impeded, and a distaste for solid food, with an inability to digest food, and with symptoms of pain and flatulency after eating, are the common proofs of the injury that is being inflicted. The great breathing muscle, the diaphragm, which separates the chest from the abdomen, and which by its descent, in contraction, causes the chest to fill with air, is impeded in its motion and is therefore unable to sustain a free respiration. The large veins from the lower part of the body which pour their blood into the right side of the heart are compressed, and in the worst instances the heart itself and the lungs themselves are actually subjected to restraint.

By these means the organs of the circulation, not less than the organs of respiration and digestion, are disturbed, to the detriment of the whole of the body, which depends on these organs for its nervous power, its muscular force and its nutrition in every part. To the symptoms of indigestion are added breathlessness on slight exertion or excitement, coldness of the extremities, weakness of muscles, constipation, headache, and other evils not less severe.

The effects of mechanical pressure of the kind described are not confined to the mere periods of time at which the pressure is applied. They extend to after life and when long continued produce an imperfect build, of the chest and of the trunk of the body, which is never lost. Women thus deformed when it is their turn to become mothers pay a penalty of suffering which would have been spared them if their bodies had developed into the healthy and beautiful form devised by the hand of Nature

The evils arising from compression of the chest and body in early life are not exclusively restricted to the female sex. Schoolboys and youths constantly practise the habit of binding up their clothes, round their bodies, by means of a belt tightened firmly above the hips, instead of wearing the brace over the shoulder. Some boys and youths are also taught the plan of putting on an extra belt for "holding in the breath," before they run or leap. In the pursuit of certain active businesses in which weights have to be carried this same system of wearing a tight belt is adopted and practised by working-men, until the artificial and ingenious support, as it is assumed to be, becomes, like the corset of the woman, a veritable necessity.

To the belt the same objection applies as to the tight band and corset. It impedes the free motion of the abdominal organs; it impedes the freedom of the respiration; it interferes with the circulation; in the young athletics who wear it while they are running, rowing, climbing, wrestling, it tends to bring on hernia, —rupture.

Mechanical evils of a severe kind result from other modes of pressure on the body. The pressure of a tight cravat is injurious. By the pressure of a tight garter the leg is sometimes actually indented below the knee so that the free return of blood by the veins is prevented and the varicose vein of the lower limbs is, I may almost say, the natural consequence.

Pressure, irregular and excessive, on the foot, by the tight and badly-fitting shoe or boot, is another mechanical evil from dress, becoming, in exceptional instances, more than local. The foot unequally compressed at particular points is distorted, is made subject to hardness of tissue in form of corn or bunion, is deprived of the elasticity and strength of its arch, and is enfeebled in its nutrition. By the boots and shoes made for women and children with high, pointed heels, a more than local injury is inflicted. Each time the body comes down with its full weight upon the raised heel, it receives a slight shock or vibration which extends through the vertebral column, and being often repeated injures the column and its nervous mechanism. I have known symptoms of nausea and faintness produced by the wearing of these unnatural and absurd articles of foot dress, which put the feet on pivots, and, in addition to the mischiefs named, produce an uncertain and ungainly gait.

Our ladies are further subject to weight, annoyance and impeded movement by the full, flowing and long habiliments which are suspended from their waists to trail uselessly on the ground, make friction, and gather dust. The bearers of these ridiculous garments have to move under such a load and encumbrance, it is impossible for their limbs to be properly exercised, for their breathing to be unembarrassed, or for their body to exist in such freedom from restraint as to enable their digestive apparatus to remain in active function. In short, scarcely a woman in the better ranks of society, if she obey the law of fashion as to dress,—however carefully she may regulate her diet,—can escape persistent indigestion, together with palpitation and breathlessness, whenever she essays to make the slightest effort at sharp movement or healthful exertion.

It is as if the fashion willed that to be fashionable is to be physically disabled.

From Errors in Change of Dress.

In so variable a climate as that of England, many dangers spring from changes of attire at different seasons and under varying conditions of heat and cold. In the summer and in the early autumn the danger is not very great, but in the first part of winter and in the first part of spring it is at its highest. In the beginning of winter the light autumn clothing is worn, unconsciously, too long. Then comes a sudden fall of temperature, with excess of moisture and fog, and the body, only half protected, is robbed, as by a violent shock, of its heat. Its minute vessels are thereby paralysed, reaction, fever, and congestion of the lungs succeed, and the commencement of a cough which lasts through the winter, or of an asthma in those who are disposed to asthma, or of consumption in those who are tainted with that malady, or of croup in the child is the result.

It is in the pulmonary circulation that the congestive evil is most frequently developed; but that rule is not without exceptions. I have seen the bad influence of sudden cold manifest itself in acute diarrhœa; and, indeed, amongst our poorer and worst protected classes, there is rarely ever a sudden accession of cold weather, in the latter part of autumn and beginning of winter, unaccompanied by an epidemic diarrhœa.

During the winter it is the practice to adapt the dress to the weather, and to be always rather well provided with extra warm clothes than the contrary, so that in this, the most inclement period, the risk is less than it is at the periods when the warm and cold seasons are on the turn. Nevertheless, an error of serious import is committed, even at this time, when, as one would think, all who value life and have means to cherish it, would be on their guard. As the "season" arrives, as the evening parties commence, the error commences. It applies almost exclusively to the female sex, and to the youngest and feeblest of them. From the warm room at home, dressed in the low thin ball-dress, with the shoulders and chest and neck but loosely covered, the young lady speeds, in the carrriage, to the house of entertainment. She enters the ball-room, dances until she is in a glow, and from that temporary tropical atmosphere is suddenly led, that she may become cool, into the corridor or refreshment saloon, or picture-gallery, or supper room, passing at once, from a temperature say of 65° or 70° Fahrenheit to 35° or lower, perhaps to some degree below freezing-point. The intensity of the risk is equalled only by the folly of it. Common cold, sore-throat, bronchitis, rheumatism, or the first development of tubercle, is thus engendered.

With the advance of spring the dangers increase. A few bright days in March make winter clothing feel heavy and uncomfortable. The warm under-flannel is left off or is replaced by a cotton garment, and the overcoat or woollen shawl is thrown aside. Suddenly there comes a rapid fall in the temperature and a biting east wind. The thoughtless are now literally entrapped. The penalty is the infliction of recurrent disease in those who have been recovering from winter illness, and the prostration of many who, throughout the winter, have held on free of all disease other than that sense of deficient vital power which the long trial of winter cold inflicts even on the most robust.

While speaking of the warmth of clothing for inclement weather, it would be incorrect not to speak of weight in relation to warmth. Many persons mistake weight for warmth, and thus feeble people are actually borne down and weakened by the excess of heavy clothing which is piled on them. This is an unnecessary evil and one to be avoided. Good woollen or fur fabrics retain the heat, and yet are light. It is when fabrics intended for sustaining warmth are made up of cotton that the mistake of acccepting weight for warmth is made.

The error in dress during the summer is, chiefly, that of wearing dark clothes. The oppression that is felt in tropical weather from carrying black garments, which so readily absorb the heat, is most severe. Women who feel themselves obliged to wear heavy crape mourning, in order to indicate late bereavement, are subjected during the summer heat to nervous headache and intense exhaustion.

The same errors are often made, at different seasons of the year, in respect to bed-clothes as in respect to ordinary every-day clothes, and with the same results. Weight of bed-clothes is constantly mistaken for warmth, and the chest is loaded with layers of heavy material when a German coverlet of one-fourth the weight would ensure double the warmth, and leave the respiration unembarrassed.

From Errors in Ventilation of Dress.

The body in order to be properly clothed must be covered so as to be protected, by its covering, from rain and external moisture. At the same time the clothing should be so ventilated that the fluid and gaseous excretions of the skin may not accumulate. If this precaution be not taken some disease, local or general, is all but sure to manifest itself. The wearing of the unventilated beaver hat is a ready method of suppressing the natural growth of the hair, and of causing to be retained in the hair that effete, epithelial scale vulgarly called scurf. The long leathern boot is another unventilated, unwholesome receptacle of the exhalations of the body. The most dangerous of them all is the tight waterproof coat; this garment, retaining the secretions from the larger portion of the surface of the body, suppresses gaseous transpiration, locks up, in the saturated under-clothing, the acid fluids excreted by the skin, promotes indigestion by interfering with transpiration, and induces, more quickly than by any arrangement,—short of one that might be purposely devised for the sake of experiment,—rheumatic disease. When waterproofs were first worn the number of rheumatical patients who suffered through using them was quite phenomenal. The larger and looser impermeable covering now sold, and usually adopted, has met the danger partially, but, in a limited degree, it still exists.

From Errors in the Dyeing of Dress.

The introduction of wearing apparel, socks, stockings, and flannels which have been made, by new processes of dyeing, to assume a rich red or yellow colour, has led to a local disease of the skin, attended, in rare cases, with slight constitutional symptoms. This disease is due to the dye stuffs. The chief poisonous dyes are the red and yellow coralline, substances derived from that series of chemical bodies which have been obtained of late years from coal tar, and commonly known as the aniline series.

The colouring principle is extremely active as a local poison. It induces on the skin a reddish, slightly raised eruption of minute round pimples which stud the reddened surface, and which, if the irritation be severe and long-continued, pass into vesicles discharging a thin watery ichor and producing a superficial sore. The disease is readily curable if the cause of it be removed, and, as a general rule, it is purely local in character. I have, however, once seen it pass beyond the local stage. A young gentleman consulted me for what he considered was a rapidly developed attack of erysipelas on the chest and back. He was, indeed, covered with an intensely red rash, and he was affected with nervous symptoms, with faintness and depression of pulse, of a singular and severe kind. I traced both the local eruption and the general malady to the effect of the organic dye in one of those red woollen chest and back "comforters" which are commonly worn in cold weather. On removing the "comforter" all the symptoms at once ceased.

Happily the insolubility of the dye stuff in water and in the natural secretions of the skin prevents its ready absorption into the body; for if it were easily absorbed it would actually prove fatal. Tardieu and Roussin found that coralline, dissolved in alcohol and introduced, in doses of a few grains, into the bodies of the lower animals, destroyed life, and that the liver of an animal which had been a few days under its influence passed into a fatty degeneration. The lungs of animals subjected to the poison assumed a peculiar colour as though they too had been dyed. Roussin dyed a skein of silk from the colouring stuff extracted from the liver and lungs of poisoned animals, and suggested this process as a mode of detecting the poison in suspected cases of death from its action.

From Uncleanliness of Dress.

Uncleanliness of attire leads to disease, or more correctly speaking, creates conditions favourable to the invasion of disease. Clothing worn too long a time becomes saturated with the excretions and exhalations from the body, and, by preventing the free transpiration from the surface of the skin, induces oppression of the physical powers and mental inactivity.

This observation will be accepted by most persons as true in respect to linen and woollen garments worn as under-clothing; it is equally true in regard to those outer garments which are often worn, unremittingly, until the linings, torn and soiled, are unfit altogether for contact with the cleaner garments beneath them. Health will not be clothed in dirty raiment. They who wear such raiment suffer from trains of minor complaints; from oppression, dulness, head-ache, nausea, which though trifling in themselves, taken one by one, when put together greatly reduce that standard of perfect health by which the value of life is correctly and effectively maintained.

Unclean clothing is sometimes a direct means of conveyance of disease. The unclean fabric becomes saturated with poisonous substances, with the fumes of tobacco for instance, and holds its wearer in a persistent atmosphere charged with unwholesome vapour. Still more seriously it becomes the medium of the poisons of the spreading diseases. I could cull from my note-books many examples of this last-named danger, but must be satisfied to mention one or two striking and brief illustrative facts. I have known scarlet fever carried by the clothing of a nurse into a healthy family, and communicate the disease to every member of the family. I have known cholera to be communicated by the clothes of the affected person to the women engaged in washing the clothes. I have known small-pox conveyed by clothes that had been made in a room where the tailor had by his side sufferers from the terrible malady. I have seen the new cloth, out of which was to come the riding habit for some innocent child to rejoice in as she first wore it, undergo the preliminary duty of forming part of the bedclothing of another child stricken down with fever. Lastly, I have known scarlet fever, small-pox, typhus, and cholera, communicated by clothing contaminated in the laundry.

Thus the uncleanly garments on the bodies of the unclean, the workrooms of the makers of garments, the very laundries in which cleanliness is sought, are all liable to become sources of those scourges which, "still as the breeze but dreadful as the storm," baffle yet our finest art, and imprint on our fair country the fields of pestilence which blacken, as with national mourning, the map of the geographer of disease.

CHAPTER XX.

DISEASE FROM IMITATION AND MORAL CONTAGION.

UNDER the names of imitation, moral contagion, sympathy, and allied terms, there have been recognized since the time of Esquirol a series of phenomena of disease which are of singular interest and importance.

The phenomena are of nervous type, and, happily, are often transitory in their course; but they are apt to become permanent, and when they do it is hard to distinguish them from symptoms which result from true organic disease.

The phenomena of which I am about to treat are never, as far as we know, truly organic. They are functional derangements of nervous centres, the effects of which simulate those irremediable derangements which spring from positive organic changes of the same centres. They are imitative diseases as well as diseases of imitation.

Except for this difference in relation to organic root, the diseases of imitation and moral contagion are singularly akin to true physical diseases.

When they are seen in isolated instances they are often the same to the letter. When they spread, they spread precisely after the manner of an ordinary spreading disease of the actual physical order. Now they assume a mere sporadic form, that is to say, are confined to a limited number of persons in a limited area; again, they widen into great epidemics, attack multitudes of persons, and exhibit their seasons of origin, intensity, and decline.

The analogies go further. The common contagious disease is often traceable to an imported case or to a spontaneously originated case. In the moral epidemics the same origins are always to be found. In the common epidemic one prevailing disease reigns, and, for a time, supersedes every other. The same rule extends to the moral epidemic. Sometimes a moral epidemic succeeds and as it were supersedes a physical; as when the dancing mania of the middle ages, one of the purest of moral epidemics, succeeded and superseded the great physical epidemic of Black Death.

In physical epidemics all persons are not alike susceptible to the influence of the contagion; some are extremely susceptible, others are unsusceptible, and some, indeed, seem predisposed to the contagion as if by hereditary disposition. The same is characteristic of the moral contagious maladies.

Physical contagious diseases recur in cycles which present a remarkable regularity, and certain of them are special to certain seasons. The like order of progression and of selection of season has characterized the great moral epidemics. Thus an epidemic of the moral type, marked by symptoms of convulsion, which appeared and reappeared in the Shetland Islands, and which has been described by the Rev. Mr. Archibald, was always a disease of the summer season.

The similarity of physical and moral contagious disease is most marked in examples where the moral contagion appears at periods when true physical diseases are prevalent, and when the imitative symptoms are of the same character as the real. Physicians themselves are often sorely perplexed under these circumstances. During epidemics of cholera I have seen patients of whom it was impossible to say, for a time, whether they were suffering from the real or the imitative malady.

To complete the analogy between the physical and the imitative or moral diseases, there remains the fact, that both classes are most easily suppressed by the plan of separating the diseased from the healthy. The dynamics of the two forms of disease are the same; they go forth on and by the same conditions; they progress on the same plan; they are brought to rest by the same means. Possibly, one may run into the other, the moral into the physical. Dr. Baker, in a recent report on an epidemic of "tetanoid fever" or "cerebro-spinal meningitis" occurring in Michigan State, relates, that in several instances the intense fear of the malady seemed to be the immediate excitant of it. I believe I have witnessed the same fact in examples of cholera.

When from the general we descend to the particular facts relating to diseases of imitation and moral contagion, we discover that they assume definable forms, and, to a certain extent, are classifiable.

One class is purely motional and at first volitional,—that is to say, is either intentionally or unconsciously voluntary. A second class is emotional. A third class is ideational. A fourth class is compounded of the others.

The Motional Type.

The pure motional type of the imitative disease is confined, as a rule, to individual examples, or, at most, is limited in its range. In this type the phenomena that are seen are muscular; their origin is nervous, but they appear as perverted action, as over action or as paralysis, of muscular fibre.

Some of the purest and, if I may so say, most elementary types of disease of this kind are seen in perversions of muscular movement. A child born with the most perfect position of the eyeballs was permitted, when in her third year, to be taken out daily by a good-natured servant, who, with many excellent mental qualities, had one great physical defect, namely a double strabismus, or squint. In a few weeks it was seen that the child could easily imitate the aberration, and at first, such slight importance was attached to the fact, she would be asked, in play, to squint like her attendant. A little later on the parents were amazed to find that the distortion of the eyeballs in their child was present when it was not called for, and that at last it settled into a permanent strabismus. The distortion has continued ever since, and will never be remedied, except by surgical operation.

I have seen a still more painful illustration of disease, induced in the manner now being considered, in a girl who was occasionally taken to visit a connection of her family suffering from chronic chorea,—"*Chorea Sancti Viti*" or, Saint Vitus' dance. The patient was constantly moving her hands and arms, adding, at intervals, which could almost be timed to the minute they were so regular, a peculiar grimace in which the angles of the mouth were extended, the nostrils dilated, the eyes widely opened and the skin of the forehead uplifted into folds. The child soon began to imitate certain of these movements, especially the movements of the limbs and the corrugation of the forehead. At the same time she acquired a fondness, which amounted even to a fascination, for the company of the afflicted person. After a few months it was observed, whenever the child returned from one of her visits, that she exhibited for several days the same nervous phenomena as those she had witnessed, and although the intercourse was soon afterwards stopped for ever by the death of the elder sufferer, she contracted the disease so definitely that she never recovered. A little unusual physical fatigue, an excitement, or any other influence that would leave depression of mind or body in its train, was sufficient to bring on a return of the symptoms and to give them uncontrollable sway for many hours, sometimes for many days.

One of our representative men of science described to me an outbreak of imitative chorea which occurred in his own family. A woman suffering from chorea,—St. Vitus' dance,—came to his house, and was seen by one of his children. The child spontaneously commenced to make imitative muscular movements, not in mockery of the patient, but, as if governed by some uncontrollable impulse received through the sense of sight. From this child the disease spread to another, and so on to a third. It assumed a most decided form in those affected, and would have spread through the whole of the family but for the prompt measures that were taken to suppress it. The affected were all placed in separate rooms, and the unaffected were entirely withdrawn from them. In this way the disease was limited at the commencement, and those who were seized were in a few weeks restored to health.

To muscular movements imitated from diseased persons may be added other symptoms, so that the rôle of a disease presenting mixed phenomena may be presented.

I was on one occasion consulted about a young woman, who, having been for some weeks in close communion with a patient suffering from pulmonary consumption, commenced gradually to imitate the movements of breathing and the cough of the consumptive sufferer. Gradually, other symptoms were acquired, including the most perfect representation of the voice of the real patient. The paroxysm of cough increased, and the symptoms altogether seemed so real, there was, on the part of the friends of the unconsciously imitative girl, no doubt as to her ultimate fate. The stethoscope and the other objective means for detection of disease yielded, however, no evidence of the actual existence of the graver malady, and after two years of symptoms, during which time the patient went the usual round of dispensary and hospital for advice, she suddenly recovered, as I and many of my learned brethren had foretold.

There have been many assumed recoveries of this kind from consumption, and sometimes the recovery has been perfected while the patient was undergoing a particular form of treatment. Then the grand discovery of a cure for consumption has been blazoned forth, some worthy son of Esculapius has been unduly praised, or some quack has reaped false credit and dishonourable gain.

In the type of imitative disease we have now under consideration, the simulation of true paralysis, in one or other of its forms, is often presented. A lady I attended heard the details of an attack of paralysis in one of her friends, whereupon she began to present the same symptoms herself. She lost, day by day, the power of her lower limbs and, later still, the voluntary command over the whole of the lower half of her body. For many weeks this condition was present, the patient remaining so helpless that she could not, even in bed, raise her lower limbs, much less move on them. The extremest and the most varied opinion prevailed amongst the medical men, who from time to time visited her, as to the precise nature of her illness. At last, during a great crisis in her family circle, when one of the circle was expected to die, a sudden scream from an adjoining room roused her apparently dead members into life. She rose from her bed unassisted, walked rapidly into the room where the other patient was lying, and from that moment recovered the entire use of the previously and, as they seemed, hopelessly palsied limbs. The new mental condition that was aroused constituted the cure.

I have known a marked paralytic seizure occur from moral contagion after a railway accident. In all such instances, which are not assumed,—and there is no necessity in such cases to suppose that as a matter of course the symptoms are assumed,—there occurs, under the mental shock originally induced, what may be called latency of the will over those nervous centres which are in communication, by the nervous cords, with the paralyzed muscles.

There is an opposite condition of nervous tension induced by imitation, in which the whole force of the will is directed to the persistent performance of one particular muscular act. In such examples a particular muscular contraction is maintained for long periods of time. Few phenomena are more singular than these. A young girl, who was living in India, witnessed some native feats and shows at a religious festival. Amongst other sights that she saw was that of a native, whose lower limbs were drawn up to his body and were there permanently fixed. The girl was morbidly impressed by this sight and next morning was found in bed unable to rise, because one of her own lower limbs was drawn up closely and rigidly to her body. This imitative condition remained for many months, and neither by persuasion nor by force could the patient be got to straighten out the limb. She was submitted to the action of chloroform, and when her volitional power was entirely overcome by the action of the narcotic vapour, and the whole of the muscles were rendered flaccid, the limb could readily be brought down. But so soon as the narcotic effect passed away, so soon as the will regained its dominion, so soon as the muscles regained their stimulus, so soon was the limb drawn again into its contracted and rigid position.

The young lady, with the limb in the contracted state, was ultimately brought to England, where she remained for many weeks without change. One day, while her attention was entirely absorbed in a game of chess, her leg was gently straightened without the slightest opposition on her part; and, the moment she was conscious of the fact she undertook to walk up stairs. To the wonder of all her friends she accomplished the feat without demur or difficulty, and from that time onwards has remained unaffected. Interrogated afterwards as to the reason why her limb was distorted in the manner described, she expressed her entire inability to assign any reason. She was of opinion that, although she never willed the contraction, nor by any act of will maintained the resistance, yet that the idea of it was never off her mind, during her waking hours, until the moment when she was entirely devoted to the simple object of winning the game of chess. Then it seemed to her that in the excitement she had altogether forgotten the contraction, as well as the varied forcible attempts that had been made to overcome it, every one of which, she was convinced, served only to aggravate the evil. When she discovered that the limb had been brought down, the fact gave her no surprise.

The Emotional and Ideational Types.

Hitherto I have detailed instances in which the imitative disease has been purely motional and has presented itself in isolated cases, or, at most, in limited circles. In an intenser form it is presented with emotional outbreaks, and is then, to the public mind, far more striking as a phenomenon.

The grandest illustration of this type of moral contagious disease is afforded in the epidemic of the middle ages known as the dancing mania.

Under the names of "*Tarantism*," "*Secourism*," "*Convulsionairism*," and "*Sympathy*," many other outbreaks of disease, similar to the dancing mania but of a less exalted intensity, have broken out since the fifteenth century.

The study of the ideational class of moral contagious diseases would lead me too far away from the purpose of this book, which treats only of the physical man, and is confined to the phenomena of the earth, earthy. The scholar who would pursue the study into the region of metaphysics will find in the history of the witch mania, the devil mania, and the angel mania of past times much food for contemplation. He may also possibly detect in the modern phases of spiritualism, clairvoyance, shakerism, and in the New Forest jumping, much that is analogous to phases that have long since passed away, and marked evidence of the influence of moral contagion. He will find the phenomena confined to no particular creed, community, place, or time. .They may appear in a convulsionary outbreak at Montmartre, when out of a hundred and fifty girls preparing for communion, forty are attacked in five days, fifteen at the precise moment when the archbishop is holding up his hands. They may be developed in a camp-meeting of revivalists in American prairie-land. Of this, however, the student may be quite sure, that, in whatever way he meets them, they are the same phenomena, and are due to a disturbance, through the senses, of those centres of the nervous system which govern the muscular motion.

Combined Types.

An emotional contagion combined with an imitative impulse leads to certain phenomena of mental disease, the results of which are exceedingly disastrous. The distinguished Despine, of Marseilles, whose admirable works on natural psychology lift him into the front rank of mental philosophers of the physical school, records that during the first empire a soldier hanged himself in his sentry-box. Very soon afterwards a number of other soldiers, acting on the impulse of imitation, did the same, and so the influence of the contagion remained active until the sentry-boxes were destroyed, when the mischief was entirely stayed. The same admirable observer has pointed out that duelling assumes the epidemic imitative character, and that as the duel contagion goes on its course it is intensified; that a truly serious quarrel is required to lead to the first duel, while the most trifling pretext will bring about a later. Our own laws so completely command the duellist that in modern English life we are too fortunate to be able to glean a similar knowledge to that of Despine; but in the matter of the suicide our experience is parallel.

Our Monument in the city, our Duke of York's Column, our Suspension Bridge at Clifton, are so many equivalent sentry-boxes that have tempted the suicidal to imitate the suicide.

Physical Nature of Moral Contagion.

As we review the various facts that may be marshalled forth bearing on disease from imitative and moral contagion we are driven to the inevitable conclusion, that though the phenomena are derived from what are called moral causes, they must, after all, have a true physical origin. We see, by their personality, that they are due to some stimulus acting upon each individual body, and therefore to some influence as common to us as the air we breathe.

We learn that the modifications to which the affected body is subjected are like the motions which can be excited by heat, electricity, or chemical action; and when we analyze the unnatural movements we can determine, by physiological reasoning the veritable parts of the nervous organism that are placed under excitation.

In the purely motional class, the spinal and cerebellar and superior ganglionic centres of the cerebrum are the centres excited. In the emotional class, the organic nervous chain is subjected to the excitation. In the ideational and compound classes, the centres of thought as well as of motion and emotion are the scenes of disturbed functional activity.

But what is the mechanism of disturbance? An external miasmatic influence, says Bouchut. A moral influence, says Despine. My own explanation is that the phenomena are connected with disturbance,—*i.e.* with modified motion,—in the ethereal matter which, according to my theory of the existence of a nervous ether or atmosphere in the living body, charges the living nervous organism throughout its entire extent, and is the medium of communication between ourselves and the outer universe which surrounds us. In some individuals this ethereal medium is, I think, itself modified in respect to its tension and perhaps in respect to its purity, by which varying degrees of susceptibility to motion are obtained. Through it different centres of the nervous organism can be excited by external forces as readily as they can be by direct organic central injuries. Thus touched, through the senses, the results will be the same in phenomena of disturbance as when the disurbed centre is organically damaged, but with this important distinction, that the simple disturbance from outward vibration, unless it be kept up until central mischief be entailed and a casual be changed into a permanent derangement, is temporary in its action, and is curable if the influence that excites it be removed.

CHAPTER XXI.

AUTOMATIC DISEASE AND HYPOCHONDRIASIS.

THERE are certain automatic phenomena of the body which, exaggerated in character, pass into phenomena of disease. Many of these phenomena have been described by different authors, from Hippocrates downwards, under the term hypochondriasis. Hypochondriasis is, in fact, strictly automatic in many of its phases, and by including it, in disease, as one of the examples of automatism we may classify its symptoms with others of the same order.

Extreme automatic phenomena are daily witnessed and felt without exciting any wonder or suggesting the idea of disease. We call them habits, and we treat them, in many instances, as valuable acquisitions. Some of them come down hereditarily, others are acquired. It is when the automatic act or expression is repeated without meaning or object, and so frequently as to become a plague, that it lapses into disease.

The automatism of disease is sometimes seen in the form of motion of some particular part of the body. When we reach the close of the present year (1875), numbers of persons will, for several days in 1876, continue to write, automatically, the 5 instead of the 6. Many married women, especially if they have married late in life, continue, automatically, to write their maiden names. Some persons acquire a habit of saying one particular sentence or word which comes up, repeatedly, in almost every conversation. Persons who for a few months enter a room of a house on the right hand, perform that act at last with automatic regularity; and, if they change to a room on the left hand, are for years afterwards guilty of mistake whenever they approach the old door.

The automatic act extends even to sensations. If a certain impression affecting sensation be made daily on the body for a considerable number of times the sensation will recur for a period, even when the cause that first excited it is withdrawn. In very susceptible people the sensation of a draught of air is thus experienced, even when no current of air, to cause a draught, is present.

These simple phenomena are perfectly familiar to all, and so long as they are under the control of the individual they are perfectly natural. When they appear grossly exaggerated, and when they occur independently of the will of the person through whom they are manifested, they constitute automatic disease.

Automatic movement amounting to disease is exhibited in varied ways. I have known it shown, in the writings of the affected, by the repetition of some sentence or argument, in the same words, in every letter or other communication which the writer undertook to indite. This one sentence will be introduced, it may be, more than once in the same letter, and if it be omitted in the body of the letter, will be added in the postscript.

The automatic affection shows itself in other motions. I have seen it to take the direction of a movement to a certain point every day at a certain time, by the person affected. Thus one gentleman would, in defiance of all reason, walk daily to a wayside pillar or post, touch it three times with his walking cane or umbrella, and then return home. It was hopeless to argue with this automatic, for he could not argue with himself. Had he been physically resisted in his design he would probably not have made any defence, neither would he have been long annoyed at the obstacle put in his way; but, let alone to follow his own course, he would as certainly strike the post as a clock would strike the hour.

Again, the automatic movement may be that of some particular muscles, as those of the hand when it is engaged in holding a pen, or casting up money; or of the occipito-frontalis muscle, so that the hair on the fore part of the head is drawn forcibly back; or of the diaphragm, causing a long-drawn, deep and sorrowing sigh. In one extremely painful example I saw automatic phenomena of eructation and choke, followed by a spasmodic jerk as if the head were being half dislocated.

Automatic movements of expression in speech are equally striking phenomena. The illustrious Thomas Willis, he who gave the world of science the first true light on the functions of the different parts of the brain, relates a remarkable instance of this character. Willis considered sleep to be an automatic act, and including under the name of the "sensitive soul" that part of the mental organism which is "void of all science and proper direction," argued that the action of this part is determinated by outward accidents and circumstances. Wherefore, he adds, "the animal spirits in what path they are once led, unless they be hindered, will repeat to a hair their former tracts." Hence it is that we both sleep and also awake at set and wonted hours; also we expect and hardly pass by the same times of dinner and supper, "so solemn the manner of nature is to do the same thing which it did before, and till being taught new things, it is the manner of its government constantly and exactly to observe the old."

He gives an example of this kind of "assiduity," which, says he, "is admirable." A youth living for some years in his neighbourhood, "though he were silly and foolish, yet did he know exactly, without any sign, the interspaces of the hours, and as often as the space of a whole hour was elapsed, as if he had been a living clock, he would presently personate the like number of the hour, with so many hoarse sounds, and no business or employ about any other occupation could make him omit this task. He at the beginning was wont to imitate aloud, by making a noise, every stroke of the sounding clock; and as often as he heard the sounding of the bell of the clock, presently he cried *one, two, three*, &c., repeating successively the several pulsations. Hence, it happened afterwards that the animal spirits, by daily imitation, being accustomed to be stirred up by such a motion, according to the set spaces of time, at length they were able to distinguish the same periods of their own accord, nothing directing, as if the sliding spaces of time had been measured out by the wheels of a clock."

In persons suffering from hysterical excitement, various symptoms present themselves automatically, with singular exactness as to time. In this manner pain in the form of neuralgia, or tic, will recur with the precisest exactitude; and, I am of opinion, that in most cases periodical neuralgia is of this automatic nature.

The most striking instances, however, of automatism in disease are exhibited in the hypochondriacal. Hypochondriasis is a malady almost as exclusively confined to the male sex as hysteria is to the female. It occurs commonly in men of middle life, and it is presented, as a rule, in two classes of men,—in those who, either from neglected education or natural weakness, are of feeble intellectual power, or in those who, by great mental struggles, have worn out their reasoning faculties. In these persons, to whichever of the two classes they may belong, the controlling, reasoning, intellectual faculty is lost, and the automatic action or expression is allowed to take its own course. Thus, without reason, some automatic act recurs with clock-like regularity, and is persistently the theme of the sufferer's conversation. The words and terms in which he describes his ailments, the processes of feeling his own pulse and otherwise investigating his own symptoms, become automatic.

In this variety of disease the physician meets with the singular phenomenon of a patient, who may exhibit the most perfect subjective train of symptoms, with not a single objective symptom to indicate any form of organic derangement or deterioration. He hears the symptoms described month after month in the same words, and yet he sees no physical change. One patient will fix on one particular organ as a seat of pain, and will exclaim every two or three minutes during a visit, "Oh! the agony, the agony"; yet his face shall be free of all evidence of suffering, and, if his attention can be for a moment diverted to other subjects the idea of the pain will, for that moment, disappear. Another patient will go to bed every night declaring he shall not sleep; he will compose himself naturally to sleep and will sleep perfectly during the whole night; yet his first morning statement will be a solemn declaration, which he will repeat, in the same words, many times an hour the whole day through, that he has never closed his eyes. A third representative of this class of sufferers will affirm that he distinguishes a tumour or swelling in some part of his body, which tumour is imperceptible to every one else. The sensation has become to him like a reality which he describes automatically.

I need not tender further illustrations of these forms of automatic disease, but one word more may be said respecting them. It is, that when the automatism is fairly established, the reasoning belief of the patient is so far in abeyance that no real importance need be attached to the repeated statement. This knowledge is a source of great relief to those who have to watch the progress of the automatic hypochondriac who sometimes goes so far as to declare, with periodical exactitude and persistent repetition, that he will commit suicide or do some other desperate deed. The fact of this repetition proves, mostly, the mere automatic character of the assertion, indicates that there is no reasoning intention at the bottom of the threat, and removes, consequently, much of the anxiety which might otherwise prevail.

In conclusion: many ordinary acts of life which become dangerous to life, or which induce symptoms of disease more or less important, are often purely automatic. I am convinced that great numbers of alcoholics indulge, to a fatal extent, in the vice of intemperance from the automatic condition into which they are trained by frequent repetition of the same act. We hear people say, significantly, of some hard drinker who is going wrong, that "he lifts his hand too often to his mouth." The description is perfect of an automatic movement.

In a minor way the smoker or snuff-taker disturbs his digestion by automatic action. He is daily absorbed at certain hours in some particular pursuit, and, if he could be watched, it would be detected that, at regular moments which could be measured as to time, he will take a pinch of snuff or light a pipe or cigar. The automatism is so perfect, that left free the automatic act will be carried out, without disturbing the reasoning faculty for a moment; but if the act be hindered, the reason may be at once abruptly arrested.

The most inscrutable feature of automatism is, after all, its hereditary feature. That pure automatic acts descend in line from parent to child, and that the tendencies, tastes, pleasures, passions, diseases, descend automatically, are facts as clear as any that science has revealed. All acts that are essentially motor,—such as sporting and fighting,—over which the reason exerts so little control, even in this day of advanced thought, are automatic. No wonder, then, that actions of disease, which always by their existence imply some reduction of reasoning power, should also be automatic.

CHAPTER XXII.

INTERMARRIAGE OF DISEASE.

THE induced diseases of modern life cannot justly be considered without a brief,—and it shall be a brief,—reference to one of the most solemn of their predisposing causes. I mean the intermarriage of disease by the union of persons who are strongly tainted with fatal maladies which must, in the ordinary course of events, appear in their offspring. It is the common impression that injuries of this class are only effected through marriages of consanguinity. Hence marriage between cousins is objected to; but in plain truth the question of consanguinity is secondary. There is no doubt that if cousins, each possessing an original family taint, marry, the result may be doubly disastrous to the offspring. This, however, is not on account of the consanguinity, but because both persons are similarly infected with the taint. I mean by this, that if they had not been related, and had been similarly infected, the results to their offspring would be the same.

We ought, therefore, to take a much wider view of the subject than that which is bounded by consanguinity.

The worst intermarriages of disease are those in which both parents are the inheritors of the same disease, as where both are disposed to consumption, to cancer, or to insanity. Under these circumstances it is all but impossible for the majority of the offspring to escape the inherited disease.

Intermarriages of distinct diseases are hardly less dangerous. The intermarriage of cancer and consumption is a combination specially fraught with danger. Let one typical illustration of this suffice. A young man of marked cancerous proclivity married a woman whose parents had both died of pulmonary consumption. This married couple had a family of five children, all of whom grew up to adolescence, sustaining at their best but delicate and feeble existences. The first of these children died from a disease allied to cancer, called *lupus;* the second of simple pulmonary consumption; the third, owing to tubercular deposit in the brain, succumbed from epileptiform convulsions; the fourth, with symptoms of tubercular brain disease, sank from diabetes, the result of the nervous injury; and the last, living longer than any of the rest, viz. to thirty-six years, died of cancer. The parents, in this instance, survived three of the children, but they both died comparatively early in life; the father from cancerous disease of the liver, the mother from heart disease and bronchitis.

The intermarriage of rheumatic with consumptive disease is productive of intermediate maladies in which the bony framework of the body is readily implicated. Children suffering from hip-joint disease,—*morbus coxarius*,—are common examples of this combination. Hydro-cephalic children are frequent results of the same combination.

The whole of this subject is a modern study in the natural history of disease. Some day it will be so formularised that the learned physician will be able to predict the results of combinations of disease from marriage, with arithmetical accuracy. Whether such knowledge will control the results is a question difficult to answer at this point of time.

In the present state of our civilization rank and position are considered all-important elements in the marriage contract. Wealth is considered. Relative age is sometimes taken into account. Religion and race are often made subjects of serious moment. Hereditary health as an element of the marriage contract, of what import is that? Who are so lightly studied as the unborn?

PART THE THIRD.

SUMMARY OF PRACTICAL APPLICATIONS.

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I.

THE first step towards the reduction of disease is, beginning at the beginning, to provide for the health of the unborn. The error, commonly entertained, that marriageable men and women have nothing to consider except wealth, station, or social relationships, demands correction. The offspring of marriage, the most precious of all fortunes, deserve surely as much forethought as is bestowed on the offspring of the lower animals. If the intermarriage of disease were considered in the same light as the intermarriage of poverty, the hereditary transmission of disease, the basis of so much misery in the world, would be at an end in three or at most four generations.

II.

Greater care than is at present manifested ought to be taken with women who are about to become mothers. Wealthy women in this condition are often too much indulged in rest and are too richly fed. Poor women in this condition are commonly underfed and made to toil too severely. The poor, as we have seen, fare the best, but both, practically, are badly cared for. Nothing that is extraordinary is required for the woman during the condition named. She needs only to live by natural rule. She should retire to rest early; take nine hours sleep; perform walking or similar exercise, to an extent short of actual fatigue, during the day; partake moderately of food, and of animal food not oftener than twice in the day; avoid all alcoholic drinks; take tea in limited quantities; forego all scenes that excite the passions; hear no violence of language; be clothed in warm, light, loose garments; and shun, with scrupulous care, every exposure to infectious disease.

III.

In meeting the uncontrollable causes of disease the special influence of season deserves particular regard. It should always be remembered that, other things being equal, during winter the body loses, during summer gains in weight. Further, it should be remembered that these changes are abrupt: that, in England, the loss commences, sharply, in September and lasts until April, and that the gain commences in April and lasts until September. In September, though the weather even be warm, it is right, therefore, to add to the clothing and to commence a little excess of food. In summer it is right not only to reduce the clothing, but to eat less food than in winter.

IV.

The best means of preventing the spread of the communicable diseases is perfect and instant isolation of the affected, and removal and thorough purifying of all clothing and bedding with which the affected have come in contact. It is a vulgar error to suppose that every child must necessarily suffer from the contagious maladies, and that the risk of exposure to infection is, therefore, of little moment. The chance of infection lessens with advance of life and that person is strongest who has never passed through a contagious malady. Against small-pox vaccination is the grand safeguard, but even vaccination ought never to prevent the isolation of those who suffer from small-pox.

V.

The mortality from the uncontrollable causes of disease amongst persons of advanced life, is best prevented by providing against sudden vicissitudes of heat and cold. The primary care is to guard against sudden change of vascular tension from exposure to heat when the blood-vessels are weakened by cold. Such exposure is the cause of nearly all the congestions which occur during winter, and which carry off the enfeebled. The sound practice is to maintain the body, at all hours and seasons, but especially during the hours of sleep, at an equable temperature. The temperature of 60° Fah. may be considered a safe standard.

VI.

The true danger of every form of mental exercise is the addition of worry. Laborious mental exercise is healthy unless it be made anxious by necessary or unnecessary difficulties. Regular mental labour is best carried on by introducing into it some variety. New work gives time for repair better than attempt at complete rest, since the active mind finds it impossible to evade its particular work unless its activity be diverted into some new channel. During the new work a fresh portion of brain comes into play and the overwrought seat of mental faculty is secured repose and recovery. Excessive competition in mental labour is ruinous at all ages of life.

VII.

The idea that excessive physical exercise is a sound means of promoting health is erroneous. Man is not constructed to be a running or a leaping animal like a deer or a cat, and to raise the physical above the mental culture were to return to the shortness and misery of savage life. Physical training, while it should be moderately encouraged, should be refined and made secondary to mental training. Every rash and violent feat of competitive prowess should be discountenanced.

VIII.

The combination of mental and physical fatigue, as it is practised in many pursuits at this time, is exceedingly injurious. Long journeys, each day, to and from the sphere of profession or business, are hurtful. The idea that mental labour may be advantageously supplemented by violent muscular exercise, such as is implied in volunteering, long and fatiguing walks, or laborious exercise on horseback, is an error. Moderate and regular exercise, at the same time, favours mental work. The practical point is so to regulate the physical labour that it shall not induce fatigue.

IX.

One of the surest means for keeping the body and mind in perfect health consists in learning to hold the passions in subservience to the reasoning faculties. This rule applies to every passion. Man, distinguished from all other animals by the peculiarity that his reason is placed above his passions to be the director of his will, can protect himself from every mere animal degradation resulting from passionate excitement. The education of the man should be directed not to suppress such passions as are ennobling, but to bring all under governance, and specially to subdue those most destructive passions, anger, hate, and fear.

X.

To escape the evils arising from the use of alcohol there is only one perfect course, namely, to abstain from alcohol altogether. No fear need be entertained of any physical or mental harm from such abstinence. Every good may be expected from it. True, a certain very qualified temperance, a temperance that keeps the adult to a strict allowance of one ounce and a half of alcohol in each twenty-four hours may, possibly, be compatible with a healthy life; but such indulgence is unnecessary and encourages the dangerous desire to further indulgence. A man or woman who abstains is healthy and safe. A man or woman who indulges at all is unsafe. A man or woman who relies on alcohol for support is lost.

XI.

Smoking tobacco, and the use of tobacco in every form, is a habit better not acquired, and when acquired is better abandoned. The young should specially avoid the habit. It gives a doubtful pleasure for a certain penalty. Less destructive than alcohol, it induces various nervous changes, some of which pass into organic modifications of function. So long as the practice of smoking is continued the smoker is temporarily out of health. When the odour of tobacco hangs long on the breath and other secretions of the smoker, that smoker is in danger. Excessive smoking has proved directly fatal.

XII.

Indulgence in narcotics, opium, chloral, chlorodine, ether, absinthe and all others of the class is an entire departure from natural law. Except under the direction of skilled opinion and for the cure of disease, the use of these agents is subversive of the animal functions, and is a certain means of embittering and shortening life. It is doubtful whether the freedom of the subject ought to be permitted to extend to the uncontrolled self-indulgence in these poisons. The indulgence indicates an unsound reason which requires to be governed by sound reason, temperately enforced.

XIII.

The food on which the man who would be healthy should live, should be selected so as to ensure variety without excess. Animal food should not be taken oftener than twice daily. The amount of animal and vegetable food combined should not exceed thirty ounces in the twenty-four hours, and for the majority of persons an average of twenty-four ounces of mixed solid food, a third only of which should be animal, is sufficient. All animal foods should be eaten while they are fresh and after they are well cooked. The habit of eating underdone flesh is an almost certain cause of parasitic disease. The amount of fluid taken, in any form, should not exceed the average of twenty-four ounces daily. Water is the only natural beverage.

XIV.

To escape the injuries arising from impure air it is necessary to attend to the following rules. To avoid the admission into closed apartments of air charged with any substance that offends the sense of smell. To avoid surcharging the air with vapour of water. To keep the temperature in every room as nearly as possible at the safe standard of 60° Fah. To take ample means for allowing air to escape from the room by every available outward draught, by the chimney flue especially. To admit air freely at all times, and, when a room is not in use and the external air is not charged with moisture, to allow the entrance of air from without through every window and door.

XV.

Occupations of every kind, however varied they may be, require to be alternated, fairly, with rest and recreation. It is the worst mistake to suppose that most and best work can be done when these aids are omitted. Strictly, no occupation that calls forth special mental and physical work should
more than one third of the daily life. The mi

of men of all classes ought now to be devoted to the promotion of a systematic method by which the productive labour of every life should be carried on within the limited term of eight hours in the twenty-four. The body of man is not constructed to run its completed cycle under a heavier burden of labour.

XVI.

Enforced idleness, by those who have acquired wealth, is always an error so long as the health is good. Men of business should never actually retire while they retain fair bodily and physical faculty. It is one of the gravest of errors to attempt to enforce idleness on others from the mistaken sentiment of wishing to place them beyond the necessity for work. This is against nature. The earth, which is itself ever in motion, demands ever the motion of cultivation from its inhabitants that it may be a garden properly arranged from age to age. Those, therefore, who have idleness thrust upon them, by their progenitors, should throw it off as if some necessity for work were equally theirs. By this plan they will live longest to enjoy the greatest happiness.

XVII.

The natural duration of sleep is eight hours out of the twenty-four, and those who can secure this lead the soundest lives. It is best taken from ten o'clock till six, and it is most readily obtained by cultivating it as an automatic procedure. All stimulants, all excitements, all excessive fatigues, all exhaustions pervert sleep even if they do not prevent it. The room in which sleep is taken should be the best ventilated and the most equably warmed room in the house. The air of the room should be maintained at the natural standard of 60° Fah., and the body of the sleeper should always be kept completely warm. The bed should be soft and yielding. A regular tendency to sleep at other hours than the natural is a sure sign of error of habit or of nervous derangement.

XVIII.

Dress, to be perfectly compatible with healthy life, should fit loosely, should be light, warm, and porous, should be adapted to the season as to colour, should be throughout every part of the clothing, upper as well as under, frequently changed, and should be, at all times, scrupulously clean. The wearing of clothes until they are threadbare, is an invariable error in all that respects the health, to say nothing of the comfort of the wearer. All bands or corsets which in any way restrict the course of the blood in any part of the body are directly injurious. Dresses dyed with irritating dyestuffs, ought to be carefully avoided.

XIX.

Connected with cleanliness of clothing, as a means of health, is personal cleanliness. Perfected action of the skin, so essential to the perfect life, can only be obtained by thorough ablution of the whole body. The ablution ought, strictly, to be performed once in every twenty-four hours. It is best to train the body to the use of cold water through all seasons, so that the requirement for water of raised temperature may not become a necessity. The simplest and best bath is the ordinary sponge-bath. Plungings, splashings, showers and the like are mere pastimes. The occasional use of the hot air or Turkish bath is an important adjunct to the means of maintaining health.

XX.

The diseases arising from imitation and moral contagion are best avoided by taking care that the young and impressionable are removed from the sources of danger. They who are sources of danger should be isolated as much as possible.

It behoves parents, especially, to check, at once, all dangerous imitative acts and performances, and as far as possible to protect the young from all sights which suggest extravagant gestures and deformities. Education of the masses is required to remove those psychological influences leading to diseases of imitation, which spring from ignorance and superstition. The physician may point out the dangers of those moral contagions: he is powerless to prevent them.

XXI.

The automatic phenomena of disease when they appear are best removed by introducing into the daily life of the sufferer such refined tastes and amusements as will keep him from thinking too much of himself and of the peculiarities of his organic nature. The grand preventive remedy for the automatic malady is to stop it in its hereditary course by the exercise of stricter care against that intermarriage of disease which was specially considered in the first section of this brief summary.

INDEX.

INDEX.

ABSENCE of mind, 144
Absinthe, disease from, 338
Accidents, all groups of diseases viewed as, 43
Acidity from food, 364
Actors, diseases incident to, 410
Acute pleurisy in alcoholic phthisis, 255
Acute rheumatism, correlative effects of the seasons on, 59
Æsop's fable of "the belly and the members," 132
Agricultural occupations, diseases incident to, 425
Ague, paroxysm of, in unborn children; rarity of, at the present time, 14
Air, causes of impurity of, in houses, 385; disease from impurity of, 375; impurity of, from damp, 392; detorioration, 384; metallic poisons, 395; organic poisons, 380; sewer gas, 388; stoves, 391
Air of large towns and country air, 385
Air, precautions against impurity of, 497
Albumen, 258
Alcohol, abstinence from, 494
Alcohol, action of, on the blood, 224; bowels, 240; cerebro-spinal system, 218; colloidal structures, 225, 260; emotions, 240; heart, 212, 217, 231; membranes, 225, 228; muscles, 219; muscular force, 235; urine, 240; vital functions, 211
Alcohol, calculus from, 258; cataract from, 260; collapse of the nervous centres from, 222; death from, 224; diabetes from, 256
Alcohol, disease from, physiological proem, 209
Alcohol, disease of the blood-vessels from, 249; eye from, 260; heart from, 248; kidney from, 258; liver from, 256; lungs from, 251
Alcohol, effects of, on the brain, 262; epilepsy from, 265; ethylic, 210, 211; failure of speech from, 267; fall of animal temperature from, 219, 220, 231; functional disease from, 237; insanity from, 268; loss of memory from, 267; mental alienation from, 268; *muscæ volitantes* from, 242; a narcotic, 230, 232; nervous diseases from, 263; organic disease from, 248; paralysis from, 266; physiological changes from, 224; physiological deductions from the action of; sensory disturbance from, 241; not a stimulant, 232; stone in the bladder from, 259; symptoms of systemic failure from, 245; vascular changes in the skin from, 242; vascular nervous excitement from, 211
Alcoholic disease, hereditary transmission of, 271; symptoms of, 246
Alcoholic dyspepsia, 240; insomnia, 261
Alcoholic phthisis, 251; fatality of, 255; hæmorrhage in, 255
Alcoholic sleeplessness, 261; thirst, 243
Alcoholism from automatism, 482
Ammonia in impure air, 378
Ammonia-sulphur compounds, 379

Analysis of deaths from bronchitis, 57; carbuncle, 59; catarrh, 59; croup, 58; erysipelas, 59; influenza, 58; pleurisy, 59; pneumonia, 57; quinsey, 59
Analysis of the Registrar-General's returns, 57
Aneurism, Morgagni's observations on, 176; from physical strain, 175
Anger, effects of, 195
"Angina pectoris," 135
Aniline dyes, disease from, 456
Animal food, regulation of, 496
Animal secretion and puerperal fever, 90
Animal temperature, fall of, from alcohol, 219, 220, 231
Animals, effect of tobacco on, 279
Antiquity of various diseases, 14
Apoplexy and smoking, 315
"Apnœa, cardiac," 135
Archibald, (Rev. Mr.), on epidemic of disease in Shetland Islands, 462
Arrested development of important organs in unborn children, 32
Arsenic wall papers, disease from, 395, 396
Arterial relaxation from alcohol, 237
Artilleryman, aneurism in an, 176
Artists, diseases incident to, 408
Ascarides found in unborn children, 31
Ascaris lumbricoides, 348
Ascaris mystax, 353
Atmospheric change a cause of disease, 53
Atmospheric chemical changes, moisture, and winds, effects of, 73
Atmospheric pressure, effects of, 70
Atmospheric temperature, effects of, 66
Automatic disease, 475; precautions against, 501
Automatism, phenomena of, 475
Avarice, effects on the health, 194

Baker (Dr. H. B.), report on tetanoid fever, 361, 463
Baldness from unventilated hats, 454
Balls, diseases contracted at, 452
Barker (Dr. H.), researches on sewer gas, 389
Barometrical pressure and the prevalence of disease, 60
Bath, the best, 500
Beaver hat, cause of baldness and scurf, 454
Bedroom, temperature of, 499
Belts, disease from wearing tight, 448
Bichromate of potassa, ulceration from, 427
Birds, effect of tobacco on, 279
Birth, diseases antecedent to, 26; unconsciousness during, 3
Black death, modern cases of, 14
Black Hole of Calcutta, 378
Bladder, stone in the, from alcohol, 259
Blood, action of alcohol on the, 224; arrest of the circulation of, 108; changes of quality in the, 40; disease of the, from tobacco, 286; effects of tobacco smoke on the, 279; separation of parts of the, in old age, 108; the supposed seat of hereditary disease, 40
Blood-vessels, disease of the, from alcohol, 249
Bloody sweat, 15
Body, duration of the growth of, 9; effects of the constituents of tobacco smoke on the, 277; effects of the seasons on the weight of, 55, 491; primary action of tobacco smoke on the, 278; secondary action of tobacco smoke on the, 282
Boots, disease from wearing tight, 449; long leathern, 455
Bouchut on imitation in suicide, etc. 474
Bowels, action of alcohol on the, 240
Boy, diabetes induced in a, by fright, 154
Brain, dementia from failure of, 140; disorganization of, 147; Dr. Thomas Willis on the functions of the, 478; effects of alcohol on the, 262; effects of fear upon the,

201; effects of tobacco smoke on the, 280, 315; paralysis of, from rage, 198; vascular engorgement of, from alcohol, 216
Breath of smokers, 283
Bright's disease from alcohol, 259
British Association, report on chloral-hydrate, 331
Broken heart from mental strain, 124
Broken sleep, disease from, 435
Bronchitis, analysis of deaths from, 57; and smoking, statistics of, 306; and tobacco, 308
Business, evil effects of travelling to and from, 187
Business men, disease incident to, 416; effects of overwork on, 145

CAFFEINE, 364
"Caissons," health of men employed in, 70
Calculus among the diseases of the unborn, 31; from alcohol, 258
Cancer, 15; and consumption, intermarriage of, 485; early prevalence of, 299; epithelial, 301; from a fish-bone in the throat, 300; of the lower lip, 300; in the pike, 299; from smoking, 298
Carbonic acid in tobacco smoke, effects of, 277
Carbonic oxide in tobacco smoke, effects of, 277
Carbuncle, analysis of deaths from, 59
"Cardiac apnœa," 135
Cataract from alcohol, 260; Dr. Weir Mitchell on, 261
Catarrh, analysis of deaths from, 59
Catarrhs and colds, limits of, 18
Causes of disease, 43
Causes of induced diseases, 120
Cavendish tobacco, effects of, 291
Celsus on inflammation, 15
"Cerebro-spinal meningitis," 16, 360
Cerebro-spinal system, action of alcohol on, 218
Cerebrum, action of alcohol on the, 219
Cestode, 349, 353
Chemical bases of tobacco smoke, 275
Chemical changes, effects of atmospheric, 73
Chest, diseases of the, and tobacco, 304
Chewing tobacco, effects of, 292
Childbirth, effects of over-eating in, 373
Children, diseases incident to, from overwork, 419
Chloral-hydrate, disease from, 331
Chloralism, increase of, 332
Chlorodyne, disease from, 337
Chloroform, disease from, 335
Choleraic disease, 343
Chorea, caught by imitation, 464, 465
Chronic bronchitis and tobacco, 308
Cigars, effects of, 292
Circulation of the blood, arrest of, 108
Clarionet-playing, case of vertigo from, 414
Classification of causes of disease, 46
Classification and distribution of the phenomena of disease, 11
Cleanliness, necessity of personal, 500
"Clergyman's sore throat," 402
Clergymen, diseases incident to, 402
Clock, automatic imitation of a, example of, 479
Clothes, odour of tobacco on, 283
Clothes, threadbare, 499
Clothing, disease from improper, 451; during changes of seasons, 490; precautions in, 499
Cobbold (Dr.), his work on the Entozoa, 353
Coffee, effects of, 364
Cold, action of, on persons of different ages, 66; on aged people, 110
Cold and heat, danger of sudden changes of, 492
Colds and catarrhs, limits of, 18
Colic from exposure to lead, 427

Colloidal food, proper proportion of, 368

Colloidal matter, change of, in advanced age, 103

Colloidal structures, action of alcohol on the, 225, 260

"Comforter," disease from wearing a red, 456

Commercial occupations, diseases incident to, 416

Communicable diseases, 79; poisons of the, 81

Composers, diseases incident to, 415

Composition of tobacco smoke, 274

Congestion from physical strain, 179

Congestion, vascular, 110

Congestive diseases, influence of atmospheric pressure in, 72

Consanguinity, marriages of, 484

Conservation, the, of diseases, 15

Constantinople, the great plague at, in 543, 16

Consumption, from alcohol, 251; and cancer, intermarriage of, 485; caused by sleeping in a van, 382; is it contagious? 381; correlative effects of the seasons on, 59; pulmonary, symptoms of, acquired by imitation, 466; and smokers, statistics of, 305; and tobacco, 308

Contagious diseases conveyed by clothing, 458

Contagious diseases, prevention of, 491

Contagious ophthalmia, 380

Controllable diseases, 48, 50, 100

Convict prison at Wakefield, effects of the seasons on the inmates of, 55

"*Convulsionairism*," 471

Convulsion, unborn children attacked by, 32

Convulsionary outbreak among girls, 471

Convulsions, epidemic of, in the Shetland Islands, 462

Convulsions from indigestibles, 366

Coralline dyes, disease from, 456

Corpuscles, action of alcohol on the, 225

Correlative effects of the seasons on disease, 56

Corsets, disease from wearing, 446

Countrymen, effects of physical overwork on, 173

Cowpox, 98

Crape, effects of wearing, in summer, 454

Cravats, disease from wearing tight, 449

Craving for work, a stage of dementia, 144

Crenated corpuscles, 225

Crétinism and goître, 17

Cromwell on his son's death, 127

Croup, analysis of deaths from, 58

Cutaneous disease from impure air, 380

Cyanosis, case of, recorded by Dr. Mayne, 35; in children, 33, 34; from flute-playing, case of, 413; mode of death during, 34

Cysticerci, 349

Cysticercus cellulosæ, 354

DAMP, impurity of air from, 392

Dancing mania of the Middle Ages, 470

Death from alcohol, 224; from failure of digestive power, 115; from intermittent action of the heart, 107; modern sentiments on, 7; by nature, 6; painlessness of a natural, 4; painlessness of sudden, 8; from paralysis through smoking, 320; practically banished, 4; from vascular congestion, 110; view of, at various stages of life, 115

Delirium tremens, 270

De Marmon (Dr.), observations on the action of alcohol, 222

Dementia, absence of mind a stage towards, 144; craving for work, a stage of, 144; from failure of brain and mental power, 140; loss of memory, a stage of, 145; of overwork, 140, 141; poetic "frenzy" a stage towards, 143; sleeplessness a stage of, 144

De Quincey's "Confessions of an English Opium Eater," 326

Descent of disease, 44
Despine on imitation in suicide, &c., 472
Diabetes, first symptoms of, 156; from alcohol, 256; from mental strain, 153; induced by sudden fright, 154; a well-known statesman attacked by, 155
Digestion, the process of, 227
Digestive organs, disease of, from opium, 328; disease of, from tobacco, 288
Digestive power, death from failure of, 115
Dilation of the eye in smokers, 311
Diphtheria, correlative effects of the seasons on, 59
Disease antecedent to birth, 26; classification and distribution of the phenomena of, 11; correlative effects of the seasons on, 56; definition of, 11; from communicable causes, 79; external origins and causes of, 43; from external causes, 79; hereditariness of, 37; incidental to old age, 49, 50, 101; "incubation" of, 92; induced and special, 119; locality of, 18; long existence of various types of, 13, the names of, 11; and ozone, connection between, 63; process of "incubation" of, 93; in relation to race, 19; in relation to terrestrial space, 16; supposed supernatural origin of, 44; uncontrollable causes of, 53
Diseases beyond human control, 48, 50; causes of induced, 120; of descent, 44; developed in the unborn, 27; most common to the unborn, 28; number of specific, 13; in relation to historic time, 13; under human control, 48, 50, 100; viewed as accidental, 43
Distribution and classification of the phenomena of disease, 11
Distribution of poisonous particles, 85
Diuresis in hysteria from mental strain, 161
Dizziness from railway travelling, 191
Domestic occupations, diseases incident to, 424
Dracunculus medinensis, 349
Dramatic artists, diseases incident to, 410
Dreams and overwork, 130
Dress, disease from dyes in, 455; disease from errors of, 446; precautions in, 499; ventilation of, 454
"Drop wrist," 427
Drunkards, occasional, 269
Duelling from imitation, 472
Duration of life, 8
Dust, disease from inorganic, 395
Duties of physicians, 4
Dyeing of dress, disease from, 455
Dypsomania, 268
Dysentery, correlative effects of the seasons on, 59
Dyspepsia, alcoholic, 240; and heart disease, 132

EAR, effect of tobacco on the, 312
Ears, ringing sounds in, in hysteria from mental strain, 161
Ecchinococcus hominis, 356
Eczematous eruption from alcohol, 243
Education, results of overwork in children, 420
Effects of alcohol on the brain, 262
Effects of atmospheric pressure, 70; atmospheric temperature, 66; the constituents of tobacco smoke on the body, 277; electrified air or ozone, 61; lightning-stroke and sun-stroke, 75; moisture, winds, and atmospheric chemical changes, 73; the seasons on life, 54; tobacco on the brain, 315; tobacco on the ear, 312; tobacco on the organs of sense, 310; tobacco on the sense of smell, 315; tobacco on the volitional and organic nerves, 318
Effervescing drinks, 365
Electrified air, effects of, 61
"Entity" of disease, 44
Emotions, action of alcohol on the, 240

Entozootic diseases, 349
Epidemic visitations of disease, 47
Epidemics of diseases, recurrence of, 47
Epilepsy from absinthe, 339; from alcohol, 265; hereditary transmission of, 41; and insanity, supposed supernatural origin of, 44
Epithelial cancer, 301
Erasistratus on inflammation and fever, 15
Eruptions on the skin from alcohol, 243
Eruptive disease from food, 342
Erysipelas, analysis of deaths from, 59
Ether, disease from, 336
Ethylic alcohol, 210, 211
Euagrius and Procopius on the great plague of Constantinople in 543, 16
Eulenberg on the composition of tobacco smoke, 275
Euthanasia, 3
Euthanasia, examples of natural, 5; phenomena of natural, 5; the true, 4
Evening parties, diseases contracted at, 452
Exceptions to sudden death, 7
Excitement, diseases from excess of, 120
Expectoration in smoking, 294
External origins and causes of disease, 43
Exudation, symptoms of, in glandular diseases, 96
Eye, diseases of the, from alcohol, 260; effects of tobacco on the, 310

FAILURE, from alcohol, symptoms of, 245; of brain and mental power, 140; of digestive power, death from, 115
Failure of the heart, in old age, 105; subjects of, 128; symptoms of, 130
Failure of speech from alcohol, 267
"Faint-hearted" men, 126
Family tendency of susceptibility to certain diseases, 92
"Famine fever," 90, 369
Farm labourers, disease incident to, 425
Fascicola hepatica, 349, 357
Fashion in narcotics, 325
Fasting body, effects of smoking on the, 288
Fatal diseases of old age, 105
Fatality of alcoholic phthisis, 255
Fatigue, physical and mental, 493
Fear, effects of, 199; effects of, on the brain, 201; example of insanity from, 201; intermittent heart from, 200
Febrile diseases and ozone, 61
Fever and inflammation, 15
Fever, remittent, correlative effects of the seasons on, 59
Fever wards, ammonia in the air of, 379
Fibrine, separation of, in the blood, 108
Fine arts, diseases incident to workers in the, 408
Fishbone, cancer from a, in the throat, 300
Fishes poisonous in hot climates, 343
Flatulency in hysterical disease, 161
Fluke worms, 349, 357
Flute-playing, cyanosis from, 413
Fœtus, arrested and imperfect development of organs in the, 32; diseases developed in the, 27; diseases most common to the, 28; tumours and schirrus developed in the, 30
Food, diseases from, 341; regulation of, 496
Force, supposed endowment of animals at birth with reserved, 10
Fordyce (Dr.) and inoculation, 83
"Frenzy," poetic, a stage towards dementia, 143
Functional disease from alcohol, 237
Functional disease of the heart from tobacco, 302
Functional disease from tobacco, 286
Functional influences of tobacco, 285

Functional nervous derangements, 361
Funeral custom of the Greeks, 6

GAMBLING, physical effects of, 205
Garters, disease from wearing tight, 449
"Germ," the, theory, 87
Giddiness from railway travelling, 191
Glands, effects of smoking on the, 319
Glandular diseases, 95
Globules, the red, effects of tobacco on, 287
Gluttony, disease from, 341, 371
Goats, effects of tobacco on, 279
Goître and crétinism, 17
Goître from impulse of grief, 202
Gout, correlative effects of the seasons on, 59
Greek definition of melancholy, 6
Greek funeral custom, 6
Grief, effects of, 202
Grief, intermittent heart from impulse of, 203
Grief, numbness and coldness from impulse of, 204
Grotto del Cane, air of, 74
Growth of body, duration of, 9
Gums, effects of tobacco on the, 297

HÆMOPTYSIS from impulse of grief, 202
Hæmorrhage in alcoholic phthisis, 255
Hæmorrhoids from over eating, 372
Habit and automatism, 475
Hamlet, 127
Hare lip in unborn children, 33
Harp-players, disease incident to, 414
Haschish, 324, 339
Hatred, effects of, 199
Hearing, effect of tobacco on the sense of, 312
Heart, the, 125
Heart, action of alcohol on the, 212, 217, 231
Heart, action of the, in physical overwork, 173; under alcohol, 223, 231
Heart, broken, from mental strain, 124
Heart disease, from alcohol, 248; boy born with, 32; and dyspepsia, 132; and indigestion, 132; irritability in, 136; melancholy in, 136; and moisture, 73; paroxysms of pain in, 136; the secretions in, 134; sleeplessness and, 131; sudden death from, 139; from tobacco, 301; from undue exertion, 177
Heart, effects of physical overwork on the, 175; effects of rage and anger on the, 196; effects of tobacco smoke on the, 282; example of intermittent, from fear, 200; failure of the, in old age, 105; hereditariness of intermittent action of the, 38; hypertrophy of the, 182; intermittent action of, 105; intermittent action of the, from broken sleep, 441; intermittent, from impulse of grief, 203; mode of death from intermittent action of the, 107; subjects of failure of the, 128; symptoms of failure of the, 130; the, and thought and emotion, 126; undue muscular development of the, 180; wearing out of, from undue exertion, 177; work of the, 124
Heat and cold, danger of sudden changes of, 492
Heat, increment of, in glandular diseases, 95
Heated stove, case of illness from use of, 391
Heels, disease from wearing high, 449
Hereditariness of automatic phenomena, 475, 483
Hereditariness of intermittent action of the heart, 38
Hereditary diseases, 26, 37
Hereditary, health as an element of marriage, 486, 489; maladies, 37; physical qualities, 37; proclivities, physical seat of, 39; transmission of alcoholic disease, 271; transmission of injuries to nervous matter, 41

Hewson (Dr. Addinell) on mortality from surgical fever, 72
"High" game and meat, disease from eating, 346
Hip-joint disease, 486
Hoffmann (M.), disease in relation to the Jewish race, 19
"Housemaid's knee," 424
Houses, disease from living in damp, 393; impurity of air in, 385
Hurry of railway travelling, evil effects of, 186
Hydatids, 349
Hydrate of chloral, disease from, 331
Hydro-cephalus, 486
Hypertrophy of the heart, 182
Hypochondriasis, 475
Hysteria from mental strain, 159
Hysterical disease, 157

ICELAND, *Morbus ecchinococci* in, 358
Idiopathic cases of scarlet and surgical fevers, 89
Idiosyncrasies of families, 92
Idleness, ill effects of, 498
Idleness and sloth, disease from, 428
Illusions, physical origin of, 143
Imitation and moral contagion, disease from, 460
Imitation, physical nature of, 473; precautions against diseases from, 500
Imperfect development of important organs in unborn children, 32
Impurity of air by deterioration, 384; disease from, 375; precautions against, 497
Increment of heat in glandular diseases, 95
"Incubation" of disease, 92, 93, 94
Indian hemp-seed, 324, 339
Indigestion and heart disease, 132
Indolence, ill effects of, 498
Induced diseases, 49, 51, 119
Induced diseases, causes of, 120; definition and classification of, 120; from excess of excitement, 120; from excess of labour, 120; from physical strain, 164
Industrial occupations, diseases incidental to, 426
Inflammation, 15
Inflammation and fever, 15
Influence of smoking on the mental faculties, 316
Influenza, analysis of deaths from, 58
Injuries to nervous matter, hereditariness of, 41
Inoculation, Dr. Fordyce and, 83
Inorganic dust, disease from, 395
Insanity, from alcohol, 268; and epilepsy, supposed supernatural origin of, 44; example of, from fear, 201; and tobacco, 318
Insomnia, alcoholic, 261; and incipient heart disease, 131; from overwork, 442; from remorse, 443; a stage of dementia, 144
Intellectual *v.* physical development, 165
Intermarriage of disease, 484, 489
Intermittent action of the heart, 105
Intermittent action of the heart, from broken sleep, 441; hereditariness of, 38: from fear, 200; from impulse of grief, 203
Intra-uterine life, diseases developed during, 28
Irritability in heart disease, 136
Irritation from indigestibles, 365

JAUNDICE from the use of chloral-hydrate, 334
Jewish race, causes of the higher vitality of, 21
Jews, never athletes, 169; death-rate among the, 20; their endurance against disease, 19

KIDNEY, disease of the, from alcohol, 258

LABOUR, diseases from excess of, 120
Latakia tobacco, effects of, 291
Late hours, disease from, 435
Laundresses, diseases incident to, 424

Lawyers, diseases incident to, 404
Lemonade, effects of, 364
Liebreich (Dr.) and chloral-hydrate, 331
Life, duration of, 8
Lightning-stroke, case of, 76; locality of injury, 78; phenomena of, 77; and sun-stroke, effects of, 75
Limits of the phenomena of disease, 16
"Lion-hearted" men, 126
Lip, cancer of the, 300
Literary profession, diseases incident to the, 400
Lithotomy, scale of mortality from, 104
Liver, disease of the, from alcohol, 256
Lobster, siguatera from eating, 345
Local paralysis from mental strain, 149
Locality of disease, 16
Lombardo-Venetian leprosy, 17
Longevity and the development of physical power, 168
Loss of memory, from alcohol, 267; symptom of dementia, 145
Lungs, disease of the, from alcohol, 251; disease of the, from tobacco, 303; effects of tobacco smoke on the, 282; vascular engorgement of the, from alcohol, 216
Luxuries, diseases from, 121

MALARIAL fevers and moisture, 73
Malformations in the fœtus, 32
Mania à potu, 269
Marriage between persons hereditarily diseased, 484, 489; hereditary health as an element of, 486, 489
Marriages of consanguinity, 484
Mayer (M.), disease in relation to the Jewish race, 19
Mayne (Dr.), case of cyanosis recorded by, 35
Measly pork, 354
Mechanical derangements in unborn children, 31
Medical men and necessitarianism, 406
Medical profession, diseases incident to the, 405
Melancholy, Greek definition of, 6
Melancholy in heart disease, 136
Membranes, action of alcohol on the, 225, 228
Membranes, use of the, 226
Memory, loss of, from alcohol, 267; loss of, in heart disease, 133; loss of, a symptom of dementia, 145; results of excessive development of, in children, 420
Men, reason for preponderance of, 8
Menander on sleep, 444
Meningitis, 360
Mental, alienations from alcohol, 268; faculties, effects of smoking on the, 316; impressions, communication of, from mother to her unborn child, 36; labour and tobacco, 316; and physical fatigue, 493; and physical strain, 184; power, dementia from failure of, 140; strain, broken heart from, 124; strain, diabetes from, 153; strain, diseases from, 120, 123; strain, paralysis from, 148; work, necessity of variety in, 492
Mercaptan, 379
Metallic poisons, disease from, 395
Meteorological causes of disease, 53; changes on the body, example of, 54; conditions, action of, on the body, 59
Meteorology and inflammatory diseases, 65
Milner (Mr.), discovery of the effects of the seasons on health, 54
Mind, action of alcohol on the, 219
Mitchell (Dr. Weir), researches on the synthesis of cataract, 261
Mites and tobacco smoke, 278
Mode of death from intermittent action of the heart, 107
Modern sentiments on death, 7
Moffatt (Dr.), researches on ozone, 61
Moisture, winds, and atmospheric chemical changes, effects of, 73
Monstrosities, 36
Montmartre, convulsionary outbreak among girls, 471

Moral contagion and imitation, disease from, 460
Moral contagion, physical nature of, 473
Moral contagion, precautions against diseases from, 500
Morbus coxarius, 486
Morbus ecchinococci, treatment of, in Iceland, 358
Morgagni's observations on aneurism 176
Mortality from cold among persons of different ages, 66
Mother and unborn child, connection existing between, 36
Mouth, effects of tobacco on the, 292
Mucous membrane, the, 226, 293
Muscæ volitantes from alcohol, 242
Muscles, action of alcohol on the, 219
Muscular, action, perturbed, in hysteria from mental strain, 162; force, action of alcohol on, 235; paralysis from mental strain, 149
Musicians, diseases incident to, 413

NAMES of diseases, 11
Narcotic, alcohol a, 230, 232
Narcotics, diseases from the use of, 324
Narcotics, effects of, 495
Natural death, exceptions to, 7
Natural decay, disease incidental to, 101; symptoms of, 101
Natural euthanasia, examples of, 5
Necessitarianism and doctors, 406
Nematode worms, 349
Nerves, effects of tobacco on the volitional and organic, 318
Nervous centres, collapse of, from alcohol, 222; hereditary transmission of injury to, 42
Nervous diseases from alcohol, 263; from tobacco, 310
Nervous matter, hereditariness of injuries to, 41
Nervous power, failure of, from opium, 328
Nettle-rash, 342
Neufville (M.), disease in relation to the Jewish race, 20
Neuralgia, causes of, 70
Neuralgia or tic from alcohol, 229
Nicotine, action of, on the stomach, 288; effects of, 278; effects of, on the eye, 311
Nitrous oxide, phenomena of disease from use of, 326
Nomenclature of disease, 11
Nose, cause of the bloom on the, in topers, 217
Number of specific diseases, 13
Numbness and coldness from impulse of grief, 204
Numbness in hysteria from mental strain, 162

OCCASIONAL drunkards, 269
Occupations, disease incident to some, 397
Old age, diseases incidental to, 49, 50, 101; fatal diseases of, 105; separation of part of the heart in, 108; symptoms of, 101
Ophthalmia, contagious, 380
Opium, disease from, 325; disease of digestive organs from, 328; smoking, 330
Organic disease from alcohol, 248
Organic nerves, effects of tobacco on the, 318; nervous system, the, 157
Organic poison, diseases producing, 82; in air, 380; distribution of, 85; phenomena of disease induced by, 92
Organs of sense, effects of tobacco on the, 310
Origin, external, of disease, 43
Origin of poisonous particles, 87, 89, 91
Othello, strain on the actor of, 412
Overwork, dementia of, 141; diseases from, 120; and dreams, 130; effects of, on men of business, 145; paralysis from, 148; results of, in children and students, 420; suicide from, 137
Oxygen and disease, 65
Oxyuris vermicularis, 349

Ozone, connection between, and disease, 63; distribution of, 63; Drs. Moffatt and B. W. Richardson's researches on, 61; effects of, 61; and febrile disease, 61; localisation of, 64; modified by temperature, 63; physiological action of, 62

PAIN, paroxysms of, in heart disease, 136
Painless death, 4
Painters, diseases incident to, 408
Papers, disease from arsenical wall, 395
Paralysis, from alcohol, 266; of the brain from rage, 198; instance of death from, through smoking, 320; local, from playing the violoncello, 414; symptoms of, acquired by imitation, 467; from worry and mental strain, 148
Parasitic disease, 348
Parkes (Dr.), observations on vascular excitement from alcohol, 212
Passions, control of the, necessary to health, 494
Passions, disease from the influence of the, 193
Passions, the reel of the, 205
Pellagra, 17
Peritoneal secretion, "septine" obtained from, 88
Peritoneum, the, 226
Perversions of nutrition from improperly-selected food, 367
Phenomena of disease—classification and distribution, 11; from communicable causes, 79; from external causes, 79; incidental to old age and natural decay, 101; induced by organic poisons, 92; induced and special, 119; from tobacco, 286
Phenomena of diseases beyond human control, 48, 50; of functional disease from alcohol, 237; of natural euthanasia, 5; of reduced vascular tension, 157
Philip V. of Spain, death of, from broken heart, 124
Phthisis, alcoholic, 251; fatality of, 255; hæmorrhage in, 255
Phthisis pulmonalis, 15; comparative immunity of Jews from, 23; and moisture, 73; statistics of, 23; susceptibility of Saxon race to, 24
Physical, courage and the heart, 126; culture, value of, 167; design of disease, 44; effects of gambling, 205; effects of political excitement, 206; exercise, danger of excessive, 493; *v.* intellectual development, 165; labour, the natural bounds of, 164; and mental fatigue, 493; and mental strain, 184; and mental strain, fatal case of, 185; origin of spectra, illusions, &c., 143
Physical overwork, effects of, on countrymen, 173; effects on the heart, 175; mode of death from, 172; symptoms of, 170
Physical power, development of, and longevity, 168; high estimation of, 165; value of, 166
Physical seat of hereditary proclivities, 39
Physical strain, diseases from, 120, 164
Physicians, the duties of, 4
Physiological, action of alcohol, 211; action of ozone, 62; changes from alcohol, 224; deductions from the action of alcohol, 230; peculiarities and susceptibility to certain diseases, 24; phenomena of disease from tobacco, 273
Pigtail tobacco, effects of, 291
Pike, cancer in the, 299
Pipes, effects of foul, 291
Pipes, short, epithelial cancer from, 301
Plague, the great, of Constantinople in 543, 16
Pleurisy, acute, in alcoholic phthisis, 255; analysis of deaths from, 59
Pneumonia, analysis of deaths from, 57
Poetic "frenzy," a stage towards dementia, 143
Poets and their sufferings, 409

Poisons, of the communicable diseases, 81; diseases occurring from organic, 48; metallic, in wall papers, 395
Poisonous particles, distribution of, 85; origin of, 87, 91; spontaneous origin of, 89; and temperature, 85
Poisonous secretions, 90
Political excitement, physical effects of, 206
"Poor smell," cause of, 385
Pork, measly, 354
Prediction of the recurrence of certain diseases, 48
Pregnancy, precautions and rules during, 490
Premature decay from deficient sleep, case of, 440
Preponderance of men, reason for, 8
Pressure, atmospheric, effects of, 70
Primary action of tobacco smoke on the body, 278
Process of the "incubation" of diseases, 93
Procopius and Euagrius on the great plague of Constantinople in 543, 16
Professional classes, diseases incident to, 399
Proposed nomenclature of disease, 12
Puerperal fever communicated by animal secretion, 90
Pulmonary consumption, symptoms of, acquired by imitation, 466; in unborn children, 31

QUINSY, analysis of deaths from, 59

RABIES in dogs, 90
Rage, effects of, 196; effects of, on the heart, 196; example of the effects of, on the heart, 196; paralysis of the brain from, 198
Railway travelling, effects of, 186
Railway travelling, giddiness from, 191
Reade (Rev. J. B.), discovery of ammonia in impure air, 378
Recreation and rest, necessity of, 497
Recurrence of epidemics of diseases, 47
Red globules, effect of tobacco on the, 287
Reduced vascular tension, 157
Reel, the, of the passions, 205
Registrar-General's classification of causes of disease, 46; returns, analysis of, 57
"Rejuvenescence," 51
Religious "revivals," physical effects of, 207
Remittent fever, correlative effects of the seasons on, 59
Remorse, insomnia from, 443
Renal secretion, 153; action of alcohol on the, 240
Reserved force, supposed endowment of animals at birth with, 10
Rest and recreation, necessity of, 497
"Retired" men, diseases incident to, 430
"Revivals," physical effects of, 208
Rheumatic disease and moisture, 73
Rheumatism, acute, correlative effect of the seasons on, 59; causes of, 70; and consumption, intermarriage of, 486
Richardson (Dr. B. W.), researches on ozone, 61
Ringing in the ear from tobacco, 312
Robertson (Mr.), on over-eating in childbirth, 373

ST. VITUS dance, caught by imitation, 464, 465
Saline purpura, 358
Salivary secretion, effect of tobacco on the, 292
Scarlet fever, correlative effects of the seasons on, 59
Scarlet fever, malignant, 14
Schirrus developed in the fœtus, 30

Schoolroom, diseases caused by polluted air of a, 381
Sciatica from alcohol, 229
"Scrivener's palsy," 418
"Scurf," 455
Scurvy, 358
Seasons, correlative effects of the, on disease, 56; and disease, 490; effects of, on life, 54; liability to disease at change of, 451
Seat of hereditary proclivities to disease, 39
Secondary action of tobacco smoke on the body, 282
"*Secourism*," 470
Secretions, the, in heart disease, 134
Secretions, poisonous, 90
Senile gangrene, 108
Sensations and automatism, 476
Sense, effects of tobacco on the organs of, 310
Sensory disturbance from alcohol, 241
"Septine," 89
Septinous diseases, 347; poisoning, case of, 348
Servants, diseases incident to, 424
Sewer emanation, impurity of air from, 388
Sewer gas, 389
Shag tobacco, effects of, 291
Shakespeare on sleeplessness, 443
Shetland Islands, epidemic of convulsions in, 462
Shoes, disease from wearing tight, 449
Short pipes, epithelial cancer from, 301
Sight, failure of, from impulse of grief, 202
Siguatera, 343
Singers, diseases incident to, 414
Singing in the ear from tobacco, 312
Skin, eruptions on the, from alcohol, 243; vascular changes in the, from alcohol, 242
Sleep, automatism of, 478; broken, disease from, 435; proper duration of, 498
Sleeplessness, alcoholic, 261; disease from, 435; and incipient heart disease, 131; from remorse, 443; a stage of dementia, 144
Sloth and idleness, disease from, 428
Small pox, 14; developed in the unborn, 30; the virus of, 82
Smell, effects of tobacco on the sense of, 314
Smoke, composition of tobacco, 274
Smokers, breath of, 283; dilation of the eye in, 311
Smoker's sore throat, 295
Smoking, and apoplexy, 315; automatism in, 482; and bronchitis, statistics of, 306; cancer from, 298; and consumption, statistics of, 305; diseases from, 273; effects of, on the fasting body, 288; effects of, on the mental faculties, 316; effects of, on the volitional and organic nerves, 318; influence of, on communities, 322; and insanity, 318; instance of death from paralysis from, 320; summary of diseases from, 321; vertigo from, 315
Snakes, venomous, the virus of, 82
Snuff-taking, effects of, 292; effects of, on the sense of smell, 314; sore throat from, 298
Sore throat, smoker's, 295
Sore throat, from snuff-taking, 298
Specific communicable disease, 99
Specific poisons, nature of, 81
Spectra, illusions, etc., physical origin of, 143
Spectra in vision induced by mental strain, case of, 142
"Speculators," diseases incident to, 422
Speech, failure of, from alcohol, 267
Spina bifida in unborn children, 33
Spinal column affected by railway travelling, 191
Spinal cord, effects of tobacco on the, 318
Spontaneous origin of poisonous particles, 89
"Stage struck," symptoms of, 411
Statesman, a well-known, attacked by diabetes, 155
Statistics of consumption and smoking, 305

Stays, disease from wearing, 446
Still-born infants, proportion among the Jews, 19
Stimulant, alcohol as a, 233
"Stitch" in the side in alcoholic phthisis, 255
Stokes (Dr., U. S.), report on effects of political excitement, 207
Stomach, action of nicotine on the, 288; effects of chewing tobacco on the, 292; effects of snuff-taking on the, 292; effects of tobacco smoke on the, 280, 288
Stomach, in heart disease, 132
Stone in the bladder from alcohol, 259
Stoves, impurity of air from, 391
Strabismus, caught by imitation, 464
Strongylus bronchialis, 353
Strongylus micrurus, 353
Students, diseases incident to, 419
Subjects of failure of the heart, 128
Sudden death from heart disease, 139; painlessness of, 8
Suicide, from alcoholic delirium, 216; from imitation, 472; from overwork, 137
Sulphur-alcohol, 379
Sulphurous odour in lightning-stroke, 77
Sun-stroke, effects of, 77; and lightning-stroke, effects of, 75; locality of injury, 78
Supernatural, supposed, origin of epilepsy and insanity, 44
Surgical fever, "Septine" obtained during, 88
Susceptibility of families to certain diseases, 92
Sweating sickness, the last epidemic of, 14
Swede, the, and alcohol, 236
"*Sympathy*," 471
Symptoms of failure of the heart, 130
Symptoms of, glandular diseases, 95; old age, 101; systemic failure from alcohol, 245
Syncope, death from, through fear, 201
Synthesis of cataract, Dr. Weir Mitchell's researches on the, 261
Syphilis, 99
Syphilis developed in the unborn, 29
Systemic failure from alcohol, 245

Tænia solium, 354
Tape worms, 349, 353
"*Tarantism*," 470
Tartar of the teeth from smoking, 294
Taste, effects of tobacco on the sense of, 315
Tea-drinking, effects of, 362
"Tea-tasters," effects of tea on, 363
Teeth, effects of tobacco on the, 297
Teeth, tartar of the, from smoking, 294
Temperature, best average, 492, 499; of body during glandular diseases, 95; fall of animal, from alcohol, 219, 220, 231; and poisonous particles, 85, 90
Teniæ, 349, 356
Terrestrial space, disease in relation to, 16
Tetanoid fever, 360
Tetanoid fever, epidemic of in Michigan, U.S., 463
Theine in tea, 362
Thirst, alcoholic, 243
Thread worms, 352
Throat, effects of tobacco on the, 292
Tobacco, and apoplexy, 315; and bronchitis, 308; cancer from, 298; cavendish, 291; and consumption, 308; disease from, 273, 286
Tobacco, disease of the blood from, 286; digestive organs from, 288; heart from, 301; lungs from, 303
Tobacco, effects of, 495; on animals, 279; birds, 279; the brain, 315; the ear, 312; the glands, 319; on goats, 279; the mental faculties, 315; the organs of sense, 310; the red globules, 287; the salivary secretion, 292; the sense of smell, 314; the sense of taste, 315; the tongue, gums, and teeth, 297; the vision, 310; the volitional and organic nerves, 318

Tobacco, functional influences of, 285; influences of, on communities, 322; and insanity, 318; an irritant, 281; Latakia, 291; nervous disease from, 310; pigtail, 291; shag, 291; summary of diseases from, 321; Turkish, 291; and vertigo, 315
Tobacco smoke, composition of, 274
Tobacco smoke, effects of, on the blood, 279; on the brain, 280; carbonic acid in, 277; carbonic oxide in, 277; the constituents of, on the body, 277; on the heart, 282; on the lungs, 282; on the stomach, 280; volatile empyreumatic substance in, 278
Tobacco smoke and mites, 278; primary action of, on the body, 278; secondary action of, on the body, 282
Tobaccoes, effects of various, 291
Tongue, effects of tobacco on the, 297
Toothache from alcohol, 229
Training, effects of, on the constitution, 181
Transmission, hereditary, of alcoholic disease, 271
Travelling to and from business, evil effects of, 187
Trematode, 349, 357
Trichina spiralis, 349
Trichiniasis, 349
Tubercular consumption from damp house, case of, 393
Tubercular matter discovered in the lungs of the unborn, 31
Tumours developed in the fœtus, 30
Turkish baths, 500
Turkish tobacco, effects of, 291
Typhus fever, limits of, 18
Typhus, malignant, 14

UNBORN, arrested and imperfect development of organs in the, 32; diseases developed in the, 27; diseases most common to the, 28
Unborn child and the mother, connection existing between, 36
Unclean clothing a medium of disease, 458
Uncleanliness of dress, disease from, 457
Unconsciousness during birth, 3
Uncontrollable causes of disease, 53
Urine, action of alcohol on the, 240
Urticaria, 342

VACCINATION, 86
Vaccination, process of, 93
Van, consumption caused by sleeping in a travelling, 382
Vascular, changes in the skin from alcohol, 242; congestion, 110; engorgement of the brain from alcohol, 216; engorgement of the lungs from alcohol, 216; nervous excitement from alcohol, 211; tension, phenomena of reduced, 157
Venomous snakes, the virus of, 82
Ventilation of dress, 454
Ventricles of the heart, 178
Vertigo, from clarionet-playing, case of, 414; from smoking, 315; and tobacco, 315
Violoncello, paralysis from playing, 414
Virus of small-pox, 82; of venomous snakes, 82
Vision, effects of tobacco on the, 310
"Visitation" and "entity" of disease, 44
Vital force, duration of, 9
Vital functions, action of alcohol on, 211
Vitality at various ages, 67
Vocalists, diseases incident to, 414
Vohl on the composition of tobacco smoke, 275
Volatile empyreumatic substance in tobacco smoke, effects of, 278
Volitional nerves, effects of tobacco on the, 318
Volitional nervous centres, collapse of, from alcohol, 223
Volunteer system, effects of the, 184
Volunteering, effects of, 184
Vomiting under alcohol, 219

WAISTBAND, disease from tight, 447
Waiters, diseases incident to, 424
Wakefield Convict Establishment, effects of the seasons on the inmates of, 54
War mania, Dr. Stokes (U. S.) on effects of, 207
Water in food, proper proportion of, 370
Water, poison of cholera in, 346
Waterproof coats, disease from, 455
Wave of heat, effect of, 112
Weight of body, effect of the seasons upon, 55
Willis (Dr. Thomas), researches on the brain, 478
Wind instruments, diseases incident to players on, 413
Winds, and disease, 74; effects of certain, 388; moisture, and atmospheric chemical changes, effects of, 73
Wollowicz (Count), observations on vascular excitement from alcohol, 212
Wood (Dr. Thos.) experiments on ozone, 62
Work, craving for, a stage of dementia, 144
Workhouse, diseases caused in a, by polluted air, 381
Worms, fluke, 349, 357; tape, 349, 353
Worry, danger from, 492; diseases from, 123; paralysis from, 148
"Writer's cramp," 418

Yellow fever, limits of, 18
Yerba de Nuaca, the, 324

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